Domestic and Foreign Periodicals in the Field of Organic Chemistry: A Statistical Analysis

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AS PART of a comprehensive study of periodicals in the field of chemistry, a survey was made to determine the leading domestic and foreign journals in the field of organic chemistry, the relative importance of the journals, the countries of publication, and the languages of publication. Other articles have already been published on this study (*1–4*). The data collected may be used to answer various questions about the literature of organic chemistry, especially as affected by World War II, and questions about the decline in the use of German as a scientific language, and the position of Russian as a scientific language.

Data for the study were obtained from the organic chemistry section of *Chemical Abstracts* (*5*), since it was thought that the number of articles abstracted in this publication should give a good measure of the relative importance of a chemical periodical. Two complete years were taken for the study—1937, a depression and prewar year, and 1947, a postwar year—as representative of the change over the past ten years. The information taken from *Chemical Abstracts* included name and country of the source journal, language of publication of the article, and total number of articles for each journal, country, and language. *The List of Periodicals* (*7*) was consulted as an aid in determining the country and language of individual periodicals. The language of the original article is stated in the abstract for work taken from polylingual journals. The data obtained are here arranged in three tables, by journal, country, and language.

Analysis of Table 1 reveals that *Journal of the American Chemical Society* is far out in front as the leading journal of organic chemistry for 1947, after having shared the honor in 1937 with the German *Berichte*, according to the figures. *The Journal of the Chemical Society* of London has had fewer articles abstracted as compared with 1937, but, because of the fate of *Berichte*, has moved into second place in world importance, though considerably behind the American journal. The third ranking journal from the standpoint of number of articles abstracted in 1947 is *The Journal of the Chemical Society of Japan*. This is misleading, however, as the articles abstracted in 1947 represent a coverage of six years from 1941–'46. Journals showing an increase in number of articles abstracted in 1947 over 1937 are: *Helvetica Chimica Acta* of Switzerland, *Comptes Rendus* of France, *Journal of Organic Chemistry*, and *Industrial and Engineering Chemistry* of the United States. As for the opposite side of the picture, *Berichte* and *Annalen* show a tremendous decrease in articles abstracted. Russia's *Journal of General Chemistry* and Italy's *Gazzetta Chimica Italiana* also showed a loss and Japan's *Journal of the Pharmaceutical Society* dropped out of the 1947 *Chemical Abstracts* entirely.

TABLE 1

ABSTRACTS BY JOURNAL

Journal	Country	1947		1937	
		No.	Rank	No.	Rank
J. Amer. chem. Soc.	U. S.	682	1	337	1 (tie)
J.. chem. Soc., Lond.	England	254	2	307	3
J. chem. Soc. Japan	Japan	219*	3	29	21
Helvetica Chimica Acta	Switz.	190	4	98	7
J. gen. Chem.	USSR	170	5	213	4
C. R. Acad. Sci.	France	151	6	118	5
J. org. Chem.	U. S.	149	7	49	12
Bull. Soc. Chim.	France	81	8	83	9
Bull. chem. Soc. Japan	Japan	75	9	30	19
Ind. eng. Chem.	U. S.	63	10	10	..
Rec. trav. chim.	Holland	56	11	56	12
Gaz. Chim. Ital.	Italy	50	12	100	6
Nature, Lond.	England	41	13	19	..
J. biol. Chem.	U. S.	36	14	46	13
Ber.	Germany	15	..	337	1 (tie)
Ann.	Germany	3	..	88	8
J. pharm. Soc. Japan	Japan	0	..	71	10
Total abstracts		2961		3048	
Total journals			205		222

* Data covers a span of six years.

Analysis of Table 2, summarizing abstracts by country of publication, shows again that the United States is far out in front, with three times the output of its nearest competitor, Britain, having taken over first place, probably permanently, from Germany. Britain has remained stable in number of abstracts, but, because of the collapse of Germany and Russia, has gone from fourth to second place. Germany has gone from first to tenth, with an output only 10 percent of the 1937 figure, while Russia has dropped from third to fifth having an output of only 60 percent of the 1937 figure. France has already staged a comeback from the effects of the war, showing a gain from fifth to fourth and a slight gain in total output. Other countries showing a gain in output are: Switzerland (which has doubled its 1937 output), Sweden, Spain (which shows increases in other fields as well as organic chemistry), Finland, and Canada. Japan shows a large increase, owing to the fact that the 1947 abstracts include a six-year coverage. Large decreases are shown by Germany, Russia, Italy, and India. Effects of the war explain all but the case of India. A smaller decrease is shown by Austria.

TABLE 2

ABSTRACTS BY COUNTRY

Country	1947			1937		
	No.	Rank	%	No.	Rank	%
United States ..	1057	1	35.6	524	2	17.1
British Isles ...	374	2	12.6	369	4	12.0
Japan	329*	3	11.1	205	6	6.7
France	267	4	9.0	232	5	7.5
Russia	250	5	8.4	432	3	14.1
Switzerland	204	6	6.9	99	9	3.2
Italy	76	7	2.5	156	7	5.1
India	74	8	2.5	103	8	3.4
Netherlands	62	9	2.1	67	10	2.2
Germany	57	10	1.9	611	1	19.9
Sweden	39	11	1.3	15	17	0.5
Spain	36	12	1.2	7	22	0.2
Finland	32	13	1.1	15	16	0.5
Canada	20	14	0.7	12	19	0.4
Austria	12	15	0.4	19	14	0.6
Totals	2961			3068		

* 1947 abstracts cover six-year period (1941–6).

Analysis of Table 3, summarizing abstracts by language of publication, shows an increase in the number of articles published in the English language—57.1 percent in 1947 and only 36 percent in 1937. This follows from the increase in United States and British articles and from the fact that some foreign journals are polylingual, one of the languages usually being English. Abstracts of articles in the French language have increased slightly and French is now the leading foreign language, having displaced German and Russian in the past ten years. German is now the second most important foreign language and Russian has decreased by half of the 1937 figure, now being the fourth most important foreign language, if we count Japanese as third. Russian will no doubt recover, but there is room for doubt in the case of German. Languages which have shown a gain in importance in the past ten years are: English, French, Spanish, and Finnish. The increase in the number of Spanish language abstracts is due to increased activity in Spain itself rather than in Spanish-speaking countries, which is evident from checking Tables 1 and 2. Both Italian and Dutch have decreased in importance by half in the past ten years, obviously having been affected by the war.

TABLE 3

ABSTRACTS BY LANGUAGE

Languages	1947			1937		
	No.	Rank	%	No.	Rank	%
English	1691	1	57.1	1098	1	36.0
French	339	2	11.4	301	4	9.9
German	305	3	10.3	773	2	25.4
Japanese	238*	4	8.0	171	5	5.6
Russian	222	5	7.5	395	3	12.9
Italian	76	6	2.6	156	6	5.1
Spanish	48	7	1.6	17	10	0.6
Finnish	11	8	0.4	2	..	...
Dutch	10	9	0.3	24	8	0.8
Swedish	8	10	0.3	8	13	0.3
Totals	2961			3048		

* Abstracts cover six years (1941–6).

It is interesting to compare these results with a somewhat similar study made by Gross (*6*) some twenty years ago. Although the data was collected in a different manner, an examination of this previous study will at least show the trend in importance of the journals and languages in the past twenty years. It indicates that in that time English has forged ahead as the leading language of science, putting German and French into the background. Also, Russian was of very slight importance twenty years ago but is now a serious contender for honors as the leading foreign language. Another item of note is that, whereas the German *Berichte* and *Annalen* were formerly leading journals, they have now lost some of their former importance, and on the other hand, such important journals of twenty years ago as *Journal of the Chemical Society* of London, *Comptes Rendus*, *Bulletin de la Societe Chimique* of France, *Industrial and Engineering Chemistry,* and *Gazzetta Chimica Italiana* are holding their own today.

The present study indicates that the *Journal of the American Chemical Society* is the leading world

journal in the field of organic chemistry, with the *Journal of the Chemical Society* of London, *Helvetica Chimica Acta* of Switzerland, *Journal of General Chemistry* (USSR), and *Comptes Rendus* of France following in that order. Missing from the more important journals are *Berichte* and *Annalen,* which in 1937 were in the first and the eighth place, respectively.

Among countries of publication, the United States has a comfortable lead, with Britain, France, Russia, and Switzerland following in that order. Germany has lost considerable ground, as has Italy, and Russia has lost a little ground. Sweden and Switzerland have increased in importance.

Fifty-seven percent of all articles published are now in English. French, German, Russian, and Italian, in that order, account for the remainder. The last three languages mentioned have lost ground, whereas French shows a slight gain over 1937.

Japanese periodicals, contributions, and language are placed high on the respective lists, but this is misleading, since the figures cover a six-year range.

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Production of Radioactive Mosquitoes[1]

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A RELIABLE METHOD of marking and detecting insects is greatly desired in ecological studies of certain medically and economically important species. In regions where pest mosquitoes are abundant, as in the arctic and subarctic, data on the range of dispersal and migration are needed to guide insecticidal control operations

A method has been developed for producing readily detectable radioactive mosquitoes by rearing the yellow fever mosquito *Aëdes aegypti* in beakers of distilled water containing radioactive material. The larvae were fed ground dog-biscuit, using the standard rearing techniques.

Radioactive phosphorus (P^{32}) was selected for the experiments because of its convenient half-life (14.3 days) and lack of either persistent radiation or toxic disintegration products. Its strong beta radiation permits ready detection with most of the equipment in use, and the lack of alpha or gamma radiation makes its use safer. Phosphorus was also judged to be an element which would be readily taken up and retained by the organism.

The activities of mosquitoes, larvae, and solutions were measured in an Autoscaler. The background count of 25 cpm has been deducted from all data in the tables, and all counts over 1000 cpm have been corrected by adding the factor $\left(\frac{\text{cpm}}{1000}\right)^2 \times 5$.

In order to ascertain the optimum concentration and exposure time, the following experiments were performed.

A. Second instar larvae were reared in five solutions of $Na_2HP^{32}O_4$ ranging in strength from 0.05 to 10 μc/ml. All the larvae were greatly retarded in rate of development, and at high concentrations pupation did not occur for over 20 days. At a concentration of 1 μc/ml adults emerged after 15 days and were found to vary in activity from 6,761 to 10,132 cpm.

B. Third and early fourth instar larvae were put into a solution containing 10 μc/ml. They developed normally and adults began to emerge on the sixth day thereafter. The activity of each mosquito was measured on the day of emergence, and the resulting data are given in Table 1. On the tenth day the activity of the solution was measured and found to have decreased to 0.4 μc/ml.

TABLE 1

Activity Measurements of Adult Mosquitoes from Exposed Third Instar Larvae

Days of exposure	No. of adults	Cpm of individual adult mosquitoes		
		minimum	maximum	average
6	12	2,663	132,405	36,215
7	5	7,534	32,143	18,881
8	7	6,036	37,863	29,138
9	5	30,952	39,913	37,176
10	12	4,484	82,860	27,778

[1] A similar article dealing with radiophosphorus and radiostrontium in mosquitoes by John C. Bugher and Majorie Taylor will be published in next weeks issue.

C. Pupae approximately one day old were put into solutions containing 10 μc/ml. Adults emerging 24 to 48 hours later were examined and found to average only 30 cpm above background. Newly formed pupae kept for three days in an identical solution absorbed slightly more phosphorus; ten emerging adults averaged 80 cpm with a range of 40 to 107 cpm.

D. In order to ascertain whether the radioactivity found was the result of an actual accumulation of P^{32} by the larvae, or of contamination of the emerging adults by the rearing medium, third instar larvae were put into a solution containing 10 μc/ml. Eight days later, pupae and fourth instar larvae were removed and washed ten times in distilled water. After an additional 24 hours in distilled water, some were removed and examined. Adults emerging from the washed pupae were also examined. All proved to be highly radioactive, as shown in Table 2. A sample of the water from which these specimens were removed had an activity of 212 cpm/ml.

TABLE 2

ACTIVITY MEASUREMENTS OF WASHED LARVAE AND PUPAE AND UNCONTAMINATED ADULTS

Stage	Number counted	Cpm/individual		
		minimum	maximum	average
Fourth instar larvae	7	13,304	16,876	14,076
Pupae	6	16,878	30,952	26,230
Adults	12	4,484	82,860	27,778

Calibrations of the counting equipment in our laboratory have shown that a rate of 5×10^5 cpm is the equivalent of 1 μc of P^{32}. It can therefore be calculated from the data of Table 2 that the average accumulation of P^{32} by individuals examined as larvae was 0.03 μc in 8 days, while the resulting pupae and adults contained nearly twice as much. Calculations from Table 1 show that much higher accumulations may occur, the highest recorded being about 0.25 μc. Using a generally accepted figure (*1*) for converting curies to grams, one finds that the above values represent 1×10^{-11} and 8.7×10^{-11} g P^{32}.

Additional experiments are in progress to ascertain the minimum quantities of radiophosphorus which can be used, to elucidate further the effects of radiation on development, and explain the wide variation in the accumulation of P^{32} shown by the data in hand.

Highly radioactive mosquitoes can be produced. Larvae accumulate large amounts of P^{32}, but pupae accumulate relatively little. The radioactivity thus produced is not lost rapidly either by adult mosquitoes or by larvae and pupae transferred to a nonradioactive medium.

The method described offers a convenient way of producing marked mosquitoes for studies of dispersal and predation. Valuable data on metabolic activities of mosquitoes, the effects of beta radiation on insects, etc., may be expected from further studies.

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Neil Elbridge Gordon: 1886–1949

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My most vivid recollection about Neil Gordon is that of a wintry afternoon in the mid-thirties, when I noticed from the window of my laboratory a man with a large umbrella, an unannounced visitor approaching our lonely building with a slow but purposeful gait, paying no attention to the wind and rain which seemed determined to hamper his progress. Dr. Gordon was on that day bent on one of those missions which endeared him to all who have seen him at work: enlisting interest and cooperation for one of his projects in support of chemical progress. And as the years went by I learned how characteristic that picture was of the man.

Chemical research and the teaching of chemistry have always been the twin interests of Dr. Gordon: after obtaining his Ph.D. from Johns Hopkins University in 1917 he taught successively at his alma mater, the University of Maryland, and at Central College in Missouri and Wayne University in Michigan. His numerous publications reveal his parallel interests in the problems of teaching and in several fields of research, principally in adsorption, colloids, emulsions, and dyeing. His interest in chemists as individuals was as keen as his interest in their work, and many a young instructor or professor still remembers the help and inspiration he received from

Dr. Gordon in his first attempts at embarking upon original research. Dr. Gordon also demonstrated repeatedly his ability as an organizer, and as head of the Chemistry Department at Wayne University he succeeded in a very short time in giving new impetus to the work of the Department, and in expanding its scope to include the training of Ph.D.'s.

But in addition to a career which would have taken all the time of an ordinary man, Neil Gordon always seemed to be fired by a novel idea, to want to develop a different—and often an unorthodox—way of speeding up the wheels of chemical progress. In rapid succession he thought up these new ideas and pursued them with dogged determination, often against the resistance of the timorous, but he seldom failed to secure adequate support from those who admired him for his originality and resolution, and who instinctively trusted him because he was always giving so unsparingly of his own means and energy. In this manner he conceived, created and managed in succession:

1924—the *Journal of Chemical Education,*
1929—the National Research Fellowship Program at Johns Hopkins University,
1938—the Gibson Island Conferences of the AAAS, and
1936—the Hooker Library, which in 1942 became the Kresge-Hooker Library.

The Gibson Island Conferences were operated under the sponsorship of Section C, of which Dr. Gordon was long the secretary, and in 1948 the conferences were fittingly renamed Gordon Research Conferences. As the scroll delivered to him on that occasion states:

> Dr. Gordon has introduced a new and fruitful means for the exchange and advancement of knowledge through informal meetings held in pleasant, healthy, and friendly surroundings. His faith in his ideas and his indefatigable efforts in bringing them to pass have brought lasting benefits to the science of chemistry.

The progress of science would be slow indeed without the support of such men of vision, character, and determination. We must thank our lucky stars when one shows up, and at the same time thank ourselves for our freedoms which give the individual with an original idea the opportunity to bring it into full realization if, like Neil Gordon, he has the faith and energy to do it.

William Townsend Porter: 1862–1949

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W. T. Porter was born in Plymouth, Ohio, in 1862 and received his medical training and his M.D. degree at the St. Louis Medical College in 1885. He served as acting superintendent of the St. Louis City hospital for one year, and as assistant professor and professor of physiology at the St. Louis Medical College from 1887 to 1893. During these years Dr. Porter also pursued graduate studies in Germany—Berlin, Breslau, Kiel. He was elected a member of the American Physiological Society at its fourth annual meeting in 1891. At that time probably no one could have predicted the outstanding service Dr. Porter was to render to American physiology during the following sixty years.

Dr. Porter became a member of the faculty of Harvard University Medical School in 1893, and continued a member of that faculty until his retirement in 1928. His teaching of physiology at the Harvard Medical School led him to establish the Harvard Apparatus Company, for the production of better and less expensive laboratory apparatus for both teaching and research in physiology. His work on the coronary circulation of mammals is probably his most fundamental research contribution to biology and medicine, but in his earlier years he also worked and published on growth, respiration, the nervous system, and skeletal muscle.

When Dr. Porter joined the faculty of the Harvard University Medical School physiology was taught to medical students largely by "talks and books." Fifty years later he wrote: "It was easy to say that physiology should be taught by experiments performed by the students themselves. But in 1899 the Harvard Medical School had 200 students in physiology. Working in pairs these students needed 100 kymographs. At that time this apparatus was made only in Europe, and could be imported at the cost of $200 apiece. Obviously even the richest university medical school could not meet this teaching requirement at such costs."

Dr. Porter started to meet these essential requirements for medical training by simplifying existing

laboratory equipment, inventing new apparatus, and reducing costs by quantity production, at first using the mechanical facilities of the Harvard Medical School. Very soon other medical schools wanted this laboratory equipment, but Harvard University could not sell it. This led Dr. Porter, aided financially by President Eliot, three men on the Harvard Medical School faculty, and two more citizens of public spirit in Boston to establish the Harvard Apparatus Company as a nonprofit educational institution. This company has been a large factor in providing, at low cost, equipment for research and teaching in physiology and pharmacology, not only in the United States, but in many other countries. Dr. Porter was the active head and guide of the Harvard Apparatus Company until a few months before his death. He conducted the business in the public interest and without commercial profit. When there was a modest surplus, this was used to improve production equipment, to provide a pension fund for the company's employees, and to finance the W. T. Porter Research Fellowship in Physiology, administered by the Council of the American Physiological Society. In 28 years (1921–49) the Harvard Apparatus Company has contributed a total of $38,453.00 to the American Physiological Society for the Porter Fellowship in Physiological Research. Dr. Porter twice offered to give his Apparatus Company to the Physiological Society.

The significant attention to physiological research in our country towards the close of the last century raised the question of adequate facilities for publication. In 1894 Dr. Porter was made a member of a committee to investigate ways and means to start an *American Journal of Physiology* by the then young physiological society. The society did not accept the committee's recommendations that such a journal be started. But in 1897 Dr. Porter started the *American Journal of Physiology,* as the sole responsible editor and publisher, and carried these financial and intellectual burdens until 1914, when 34 volumes of the journal had been published. In that year Dr. Porter presented the *Journal* (including all unsold numbers) to the American Physiological Society. In recognition of this great service to American physiology the society dedicated Volume 37 to him. The dedication includes this significant statement, referring to his services as editor: "A rigid pursuit of ideals by one individual frequently arouses in others lack of appreciation, criticisms, and opposition; and these he received without complaint."

In consideration of all the significant services of Dr. Porter—the early years of the *Journal,* the Harvard Apparatus Company, the Porter Fellowship—the society made him honorary president for its 50th anniversary meeting in Baltimore in 1937, and in 1948 elected him honorary life member. Referring to those early and trying years, the late W. H. Howell of Johns Hopkins Medical School said in 1938: "The American Physiological Society never gave the *American Journal of Physiology* the financial support that might properly have been expected." Dr. Porter's contributions were achieved by his integrity, his courage, and his intelligence rather than by his financial fortune. Knowing Dr. Porter, a few of his colleagues in the medical school and other citizens in Boston gave him some initial financial aid both for the *Journal* and for the Apparatus Company. But the main financial burden for both was carried by Dr. Porter. I have never heard anything but praise for the services of the Harvard Apparatus Company.

Dr. Porter's record as editor of the *Journal* is to his great credit, but even a superior editor is not a superman. There were more than a few of the younger investigators who did not take kindly to Dr. Porter's analysis, criticisms, and suggestions of their research reports submitted for publication in the first 34 volumes of the *American Journal of Physiology.* His editorial policy may be illustrated by his reply to me when I sent him in 1904, my first study on the limulus heart for publication in the *Journal of Physiology.* He wrote: "I think you are wrong both in your observations and your interpretations, but I will publish your report in the *Journal.*"

The record of Dr. Porter's unselfish and significant services to his generation is a true picture of the man, as I knew him for nearly fifty years. In these times of well-nigh pandemic hysteria, hate, and fear, William Townsend Porter's persistent and serene work for his fellow man aids our courage for today and guides our hope for tomorrow. May his tribe increase!

TECHNICAL PAPERS

Factors in Neonatal Resistance to Anoxia. I. Temperature and Survival of Newborn Guinea Pigs Under Anoxia[1]

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It is standard hospital procedure to place anoxic babies in a warmed bassinet or incubator and give them oxygen. Since the speed of chemical reactions of importance to life is, according to Van 't Hoff 's rule, doubled or trebled with each 10° C rise in temperature, some doubts appeared in the mind of the writer as to the advisability of warming the anoxic child. Accordingly, an investigation of the effects of temperature upon survival of anoxic newborn animals was undertaken.

This short preliminary account of results of this investigation is being presented at this time in the hope that it may stimulate clinical studies on the treatment of asphyxiated newborn infants.

The experiments were performed as follows: Littermate guinea pigs 24 hr old or less were used. Temperatures were taken by using a U. M. A. skin thermocouple with the sensitive element modified so that it could be used as a small colonic thermometer. Each reading was taken with the element inserted into the anus for a distance of 20 mm. Temperatures were taken immediately before and after the experiment.

The temperature differentials were produced as follows: In litters of three or more, one animal was left untreated, one was incubated for ½ hr, and one or more was cooled. In litters of two, one was cooled or warmed, the other left untreated.

The colonic temperatures of the untreated animals usually varied between 29° and 33° C. This is an example of the well-known fact that the temperature-regulating mechanism is either very inefficient or nonfunctional in neonatal mammals.

Cooling was produced by wetting all but the head and circumanal region with 95% alcohol and exposing the animal to air currents from a 12-in. electric fan. When its temperature had fallen 2° to 5° C it was placed with a littermate under a glass bell jar with a current of 95% N_2 and 5% CO_2 flowing through. Records were kept of the time of appearance of all visible reactions, timed by means of a stop watch.

In a preliminary series of experiments the animals were exposed to anoxia for 4¼ min (4 experiments, 10 animals) or 4½ min (4 experiments, 14 animals) and then removed. This length of exposure was sufficient to kill the warmed and the room temperature animals and, with but one exception, their cooled littermates recovered from the treatment. The exceptional animal withstood 4½ min of exposure but succumbed 52 sec after removal of the bell jar.

Next, experiments were performed in which the animals were exposed until dead. The time of appearance of the last slight movement of the abdominal wall in an attempt to gasp was recorded as the time of death (T.O.D.). Preliminary experiments had established that, even though spontaneous recovery may occur if the bell jar is removed before the last few weak and ineffective gasps, it does not happen when the animals are exposed to the gas mixture until gasping has stopped completely.

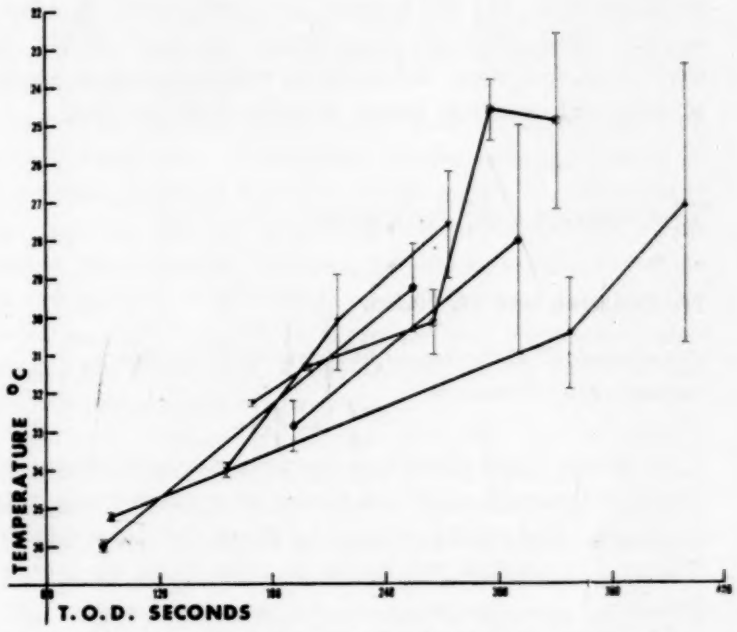

FIG. 1. Five typical experiments showing the effects of temperature on time of death (T.O.D.) of day-old guinea pigs exposed to 95% N_2 and 5% CO_2 until dead.

Fig. 1 is a graph of 5 experiments with a total of 15 animals, giving a typical picture of the effect of temperature on the survival of day-old guinea pigs. On the abscissas are shown seconds survival, on the ordinates the temperature. Each point on the graph represents one animal, with its temperature range during the experiment indicated by the thin vertical line. The midpoint of this range is used as the temperature of the animal for purposes of calculations. Littermates are indicated by the same symbol and are connected together by a heavy line.

A glance at the graph shows that there was less variation in temperature and greater consistency in results in the case of animals kept at higher temperatures than in those kept at lower temperatures. Because the method of cooling stimulated motor activity, which might be expected to reduce the animals' potential for anaerobic survival, the cooled animals were placed in the bell jar while still wet. This reduced the total motor activity of the

[1] The author wishes to acknowledge with thanks support from the U.S. Public Health Service, Research Grants Division (#RG 281), which has made possible this and subsequently appearing studies on neonatal resistance to anoxia.

animal, since part of the cooling period was passed while the animal was unconscious. This procedure was instituted because in exploratory experiments the animals which were cooled for a long time exhibited both struggling and shivering. The performance of these animals in the bell jar was poorer than their uncooled littermates, and much poorer than those in which cooling took place for the most part while the animals were unconscious.

From these five typical experiments it appears that the effects of reduction of colonic temperatures on one-day-old guinea pigs subjected to anoxic anoxia is to prolong life at about the same rate as might be expected from Van't Hoff's rule—i.e., about three times for the first 10° C differential.

Additional experiments, confirming the findings reported here and extending them to include also nembutalized animals, will be reported later when the statistical analyses of these data are complete.

It is concluded that elevation of body temperature is deleterious to day-old guinea pigs subjected to anoxic anoxia. Reduction of temperature, at least within the limits reported here, is beneficial when cooling is accomplished with minimal motor activity and shivering.

The Genera of Amoebae

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In recent years there has been considerable discussion about the correct scientific names of certain fresh-water amoebae. The recent articles by King and Jahn (*3*) and Wilber (*5*) include references to other work on the subject.

The three species concerned are: (I) *Amoeba proteus* Leidy (*Chaos diffluens*), (II) *Chaos chaos* Schaeffer (*Pelomyxa carolincnsis, Amoeba carolinensis, Chaos carolinensis*), and (III) *Pelomyxa palustris* Greeff.

The controversy embraces two separate questions: one about the relative historical validity of the generic names *Amoeba, Chaos* and *Pelomyxa*. To this question we have no contribution to make. The other question is whether (I) and (II), or (II) and (III) should be placed in the same genus, or whether they belong to three separate genera.

Since the morphological criteria seem to be insufficient to allow a clear decision of the issue, we have tried to supplement the morphological evidence with a biochemical comparison of the three organisms.

Organisms (I) and (II) are readily available and their morphology and physiology is comparatively well known. Organism (III) is, at least in Denmark, comparatively rare, and in spite of persistent search we were able to obtain only four specimens. This limited material forced us to restrict our investigation to a few characteristic properties easily determined with the micromethods at our disposal. We decided therefore to determine the contents of two proteolytic enzym catheptic proteinase (substrate caseinogen, pH 4.0) a peptidase (substrate alanyl-glycine, pH 7.4). In ad tion we measured the approximate total protein cont colorimetrically by means of the Folin-Ciocalteau agent against a tyrosine standard. Details of th methods are described in a recent publication from t laboratory (*2*). As a basis of comparison we chose cell volume rather than weight as suggested by Zeuth (*6*), since the cytoplasm of *Pelomyxa palustris* (I contains a great deal of foreign inclusions, e. g., gra of sand, which could be expected to falsify the dens much more than the volume.

Organism (III) was identified as *Pelomyxa* in the f lowing way: all four specimens were examined while al with a water immersion objective giving 40 times mag fication. The sand grains coating the surface and closed in the cytoplasm; the broad, slowly formi pseudopodia; the vacuolar appearance; and the bacte in the cytoplasm, were easily seen. One of the specime was crushed between cover slips and showed numer nuclei about 10 μ in diameter, and "glycogen bodies" 5–30 μ in size, which varied in shape from spherical ellipsoid, some being quite irregular. Another specim was fixed, sectioned, and stained. The details of bacte nuclei, and "glycogen bodies" which are described Leiner (*4*), were confirmed. These are the characteris features used for determining the species *Pelomy palustris*, and all of them are quite different from t corresponding features in *Amoeba proteus* (I) and *Cho chaos* (II). The third specimen was used for preli inary enzyme measurements, and the last and largest a mal (total volume 6.5 μl) was used for final analyses triplicate. The calculations in Table 1 for Species (III therefore, all refer to this one specimen but they we roughly checked by preliminary experiments which i dicated the order of magnitude of enzyme activity.

The values for species (I) and (II) are averages f a great number of individuals. The values for speci (III) are the means of triplicate analyses. All valu refer to a standard volume of 1 μl of cytoplasm. F

TABLE 1

	Protein	Peptidase	Proteinase	Peptidase / proteinase
	μg tyrosine	0.06 N HCl/hr	arbitrary units	
Species (I) *A. proteus*	4.0	53	43	1.2*
Species (II) *Ch. chaos*	2.6	62	28	2.2*
Species (III) *Pelom. pal.*	1.0	0.31	0.25	1.2*
Ch. chaos / *A. proteus*	0.65*	1.2*	0.65*	
Ch. chaos / *Pelom. pal.*	2.6*	200*	112*	

* These figures give ratios.

cies (I) this volume was calculated on the basis of lkley's (*1*) measurements which give an average ue of 0.15×10^{-3} µl per individual. For species (II) volume was calculated from reduced weight measurents, asuming the relation 1 µg r. w. = 50 µl volume uthen (*7*)]. The volume of species (III) was calcud from direct measurements of dimensions.

As the Table shows, in organisms (I) and (II) the gnitudes measured correspond as closely as can reasonbe expected for intimately related species. As a tter of fact, the differences fall within the range of ividual variations which can be found in one species. ganism (III), on the other hand, is decidedly different m the two others, at least with regard to the content the two enzymes. This is most clearly seen by a comrison of the ratios given in the lower half of the table. t might be thought that the remarkably low enzyme tent of species (III) is not real, but rather due to ctivation during the homogenization prior to enzyme ermination. However, this would not impair the idity of our comparison, since the homogenization and zyme determinations were carried out exactly alike in cases. Our figures thus indicate either a difference in zyme content or in enzyme stability. Both properties ght to be equally suitable for the purpose of species mparison.

The result of our study is thus quite unambiguous: if chemical features are considered as valid as morphogical ones, organisms (I) and (II) ought to be placed the same genus, while organism (III) seems rather ferent from the two others. Since nobody questions validity of the name *Pelomyxa palustris* for species II), we suppose that our results would support either generic name *Amoeba* or *Chaos* for the other two. t being taxonomists, we venture no suggestion as to ich of these it should be.

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eparation of Chloride Group Anions by artition Chromatography on Paper

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The separation of cations by partition chromatography as described in two previous papers (*3*, *4*). These parations were only possible when hydrochloric acid as added to the solvent. This prevented both hydrolysis d the existence of ions in complex and simple form at e same time. The tailing or "comet" effect of Lugg d Overell (*5*) was thus avoided.

Westall (*7*) first measured the R_f value of the Cl^- ion in several solvents and observed that the addition of NH_3 to phenol inhibited the "comet" effect and gave Cl^- ions a constant R_f value, irrespective of the accompanying cation.

Partridge (*6*)„ in a correction to his paper, observed that both Br^- and I^- travel at different speeds and interfered with the technique he used for the separation of sugars; but he did not give their R_f values or describe the shape of the spots obtained.

In this paper a new micromethod for the separation of Cl^-, Br^-, I^-, and CNS^- will be described. The solvent employed in the chromatograms is butanol saturated with I · 5N NH_4OH. This keeps the halides completely in the ionic form and appears to prevent any adsorption on the filter paper.

Separation is a simple matter in this method when compared with the technique required to show up the spots. After a trial of several techniques the simplest was found to be a method by which the paper was sprayed successively with two reagents and then washed and exposed to H_2S vapors.

The first method to be tried was an adaptation of that of Feigl (*2*). The silver chromate paper described there was prepared and the dried paper chromatogram was laid on top of it and sprayed with water. The halides were washed out and produced yellow spots on the red paper. This method was abandoned because the spots frequently moved on spraying with water, and also because the adsorption of halide ions on the paper might lower the sensitivity of the test.

The next method tried was spraying the chromatograms with silver nitrate solution, and then exposing to sunlight. This was found highly unsatisfactory, since a dark background formed which made the spots indistinct.

The most satisfactory method is as follows:

The paper is first sprayed with a mixture of ferric nitrate solution and hydrogen peroxide. The spraying is started from the liquid front and carried to within 4 cm of the starting point. This produces a red spot for CNS^-, R_f value = 0.42–0.48; and a blue spot for I^-, the R_f value being 0.29–0.32.

The whole of the paper is then sprayed with 0.1 N $AgNO_3$ solution, which discolors the spots originally formed and precipitates all four ions as insoluble silver salts inside the filter paper. This paper is now washed with very dilute HNO_3, so as to remove the excess of Ag^+ ions, two washes being sufficient. The paper is then held over H_2S and black AgS is formed wherever silver halides were precipitated. Chloride thus produces a brown spot (R_f = 0.1–0.11), and bromide a brown spot (R_f = 0.15–0.18).

In this paper the complete technique used will be described in detail, since a number of simplifications have been made to the method of Williams and Kirby (*8*), on which it is fundamentally based.

The aqueous phase is placed on the bottom of a 5-gal crock, where there is also a large Petri dish containing butanol. In the Petri dish is placed a measuring cylinder, fitted with a cork carrying a T-piece.

The paper is formed into a cylinder around the measuring cylinder, and supported at the top by perforating it with the arms of the T-piece. Narrow pieces of paper can be folded longitudinally and likewise supported. A lid is then placed on the crock to maintain a saturated atmosphere.

The development is an ascending one and the speed of the liquid front seems to decrease the farther it goes. The container was not altogether airtight, and to keep the solvent from varying in composition, it was renewed every day. In this apparatus the liquid front travels about 25 cm in 24 hr.

To prepare the solvent, 10 ml of 15 N NH_4OH was mixed with 90 ml of distilled water; this was shaken in a separating funnel with 100 ml of butanol.

The mixture separates after a very short time; the lower layer is run into the bottom of the crock and the upper layer into the Petri dish in the center of the crock.

The mixture of ammonium and potassium chlorides, bromides, iodides, and thiocyanates is concentrated or diluted so as to obtain the approximate concentration of 0.1 N. A drop of this solution is placed on the paper by dipping a thin stirring rod (2 mm diam) into the solution and then touching the paper with it about 2.5 cm away from the lower end. The adhering drop is absorbed by the paper and its position marked with pencil. The paper is then placed in the developing crock for 24 hr. Immediately on removing the chromatogram from the container, the liquid front is marked in pencil. The developed paper is dried by hanging for about 10 min in the air. This removes the ammonia and most of the butanol.

An AGLA atomizer was used for spraying reagents on the chromatograms. It produces a reasonably fine spray, but is a little too small for satisfactory use.

I^- and CNS^- travel faster than Cl^- and Br^- and can be revealed by spraying a mixture of 3% H_2O_2 and 0.1 N $Fe(NO_3)_3$ solution on the upper portion of the chromatogram. The lower 4 cm must not be sprayed with this reagent since a distortion of the Cl^- and Br^- spots may occur. The red spot of $Fe(CNS)_3$ is reasonably stable, but the blue spot of I_2 may fade in a few minutes.

The whole of the paper is then sprayed with 0.1 N $AgNo_3$ and washed twice in 0.1 N HNO_3, and the surface moisture is removed by pressing between filter papers. It is then exposed to H_2S, producing a brown spot for CNS^- and I^-, and an oblong spot of adjacent Cl^- and Br^- when both these ions are present. If only one is present a round spot is formed, which cannot be mistaken because it has different R_f measurements.

The R_f values are in reference to the liquid front, so that $R_f = \frac{\text{distance traveled by ion}}{\text{distance traveled by liquid front}}$ (*1*).

In the separation of cations two liquid fronts were noticed. This is not the case here and after drying there is little indication of the liquid front.

This new chromatographic separation of the halide groups is, in the author's opinion, highly suitable for ultimate organic analyses, since only 0.1 mg of the halide ion is sufficient to be identified.

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2,4-Dichlorophenoxyacetic Acid Inhibition of Castor Bean Lipase[1]

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The discovery of selective herbicides has aroused considerable interest in the mechanism of hormone activity. Since the growth and metabolism in the growing plant is disrupted, one might expect the enzyme systems to be affected.

Smith (*4*) showed appreciable effect on oxygen uptake of tissue slices from plants treated with 2,4-dichlorophenoxyacetic acid. One may presume that the sections of the plant functioned as entireties, and the action of the herbicide on any of the enzyme systems involved in growth and respiration would affect the observed oxygen consumption. On the other hand, we have observed no inhibition on polyphenol oxidase, α-hydroxy acid oxidase, or catalase in the presence of 2,4-D, using the tissue homogenate technique.

Preliminary studies have indicated that certain hydrolytic enzymes are affected by 2,4-D. The activity of castor bean (*Ricinus communis*) lipase was depressed by the sodium salt of 2,4-dichlorophenoxyacetic acid. The procedure used was essentially that of Longenecker and Haley (*3*). Two grams of olive oil substrate and 0.05 g of solvent-extracted castor bean meal, as the enzyme source, were weighed into 50-ml Erlenmeyer flasks. One ml of water was added to the control flasks, and 1 ml of recrystallized 2,4-D monohydrate sodium salt of the desired concentration was added to the inhibition flasks. In all cases the enzyme was activated by the addition of 0.6 ml of 0.1 N acetic acid. The flasks were incubated in a 37° C water bath. After desired reaction time, 50 ml of 95% ethyl alcohol was added to stop reaction. The degree of hydrolysis was determined by potentiometric titration of the liberated acids with NaOH to an indicated pH of 8.5. Under these conditions, slightly over half of the control substrate was utilized in a 6-hr period.

The effectiveness of the 2,4-D inhibition is of the order of 10% by 3.03×10^{-4} M. Slightly less than 70% inhibition was noted in the presence of 0.03×10^{-3} M. Harris *et al.* (*1*) have shown that sodium dichlorophenoxy acetate

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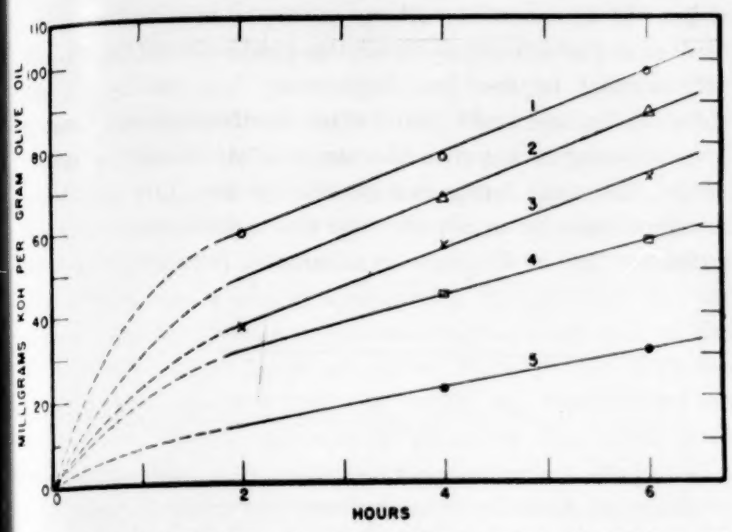

FIG. 1. 2,4-Dichlorophenoxy sodium acetate inhibition of castor bean lipase on the hydrolysis of olive oil. The curves represent varying concentration of the 2,4-D inhibitor. (1) Control, H_2O; (2) 3.03×10^{-4} M; (3) 6.05×10^{-4} M; (4) 1.52×10^{-3} M; (5) 3.03×10^{-3} M.

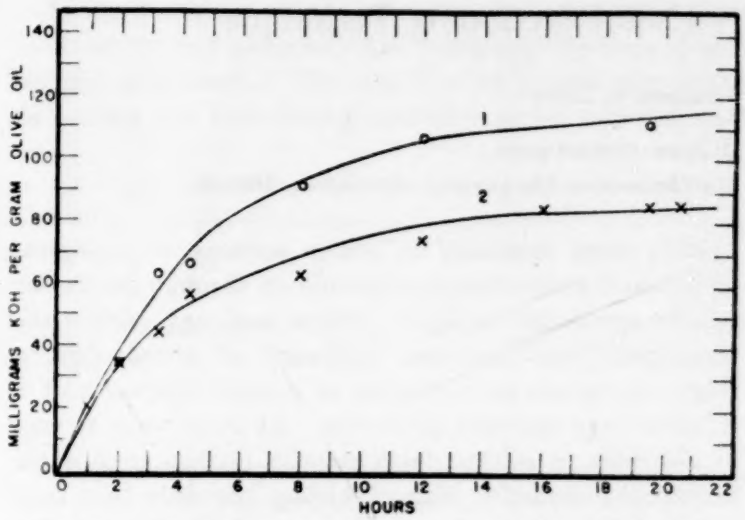

FIG. 2. 2,4-D butyl ester hydrolysis by castor bean lipase to the active 2,4-D-free acid in the presence of olive oil. Sodium oleate emulsifier added to both series of flasks. (1) Control, H_2O; (2) 0.051 M 2,4-D butyl ester.

acts as a protein precipitant at relatively low concentration. The ether-extracted castor meal contains most of the protein originally present in the beans. Since the 2,4-D would be expected to combine with other proteins as well as the lipase, the effective concentration necessary for inactivation is probably considerably lower.

In a kinetic study of this system, conditions were followed which allowed graphical determinations as developed by Lineweaver and Burk (*2*). By varying the substrate concentration, and keeping other conditions constant, an apparent increased activation occurred upon dilution of the substrate.

2,4-D is available commercially in four chemical forms: free acid, sodium or ammonium salts, amine salts, and esters. The sodium, ammonium, and amine salts, in all probability, could be converted to the 2,4-D free acid at a rapid rate by simple dissociation, *in vivo* and *in vitro*. However, the ester conversion would be more difficult to explain by this mechanism.

The possibility of castor bean lipase acting as a typical esterase on 2,4-D esters was selected for study in an attempt to explain such a conversion mechanism. The procedure used was essentially the same as described above. The reaction flask contained 8.5 ml of solution; 0.063 M with respect to 2,4-D butyl ester, 5.7×10^{-4} M sodium oleate as an emulsifier, 5.3×10^{-2} M acetic acid as activator, and castor meal as the enzyme source. The reaction was arrested and titrated as described here.

TABLE 1

2,4-D BUTYL ESTER HYDROLYSIS BY CASTOR BEAN LIPASE, AND ULTIMATE INHIBITION OF LIPASE BY THE HYDROLYTIC PRODUCT, 2,4-D FREE ACID

Grams of castor meal	% of butyl ester converted to free acid	
	21 hr	46 hr
0.05	6.32	6.13
	5.86	....
0.10	11.15	11.43
	9.76	11.43
0.30	29.74	31.97
	32.81	31.88
0.50	48.19	52.05
	48.61	....

That castor bean esterase does hydrolyze the butyl ester is indicated by the titration of liberated acid. The calculated effective concentration of 2,4-D acid product of hydrolysis, showing complete inactivation of castor bean lipase, is approximately 4.00×10^{-3} M. Thus, the 2,4-D acid approaches the same concentration, by the end of 21 hr, as shown necessary for inactivation of the lipase by the sodium salt of 2,4-D in Fig. 1.

The reaction was followed in the presence of a natural glyceride substrate. To all flasks 0.50 g of castor meal, 2.0 g olive oil, and 4.5 ml of 0.1 N acetic acid was added. The control and inhibitor series were brought to an effective concentration of 4.6×10^{-4} M sodium oleate. Butyl ester of 2,4-D was added to the inhibitor series to a concentration of 0.051 M. Total volume for all flasks was 10.5 ml. The reaction was arrested and titrated as previously described.

From Fig. 2, it becomes apparent that even in the presence of a competing substrate, the butyl ester is not effective as an inhibitor until the hydrolysis to the 2,4-D acid occurs. The time for complete inactivation of the enzyme appears to follow closely the time of inactivation shown in Table 1.

This investigation has shown that 2,4-D effectively inhibits the activity of castor bean lipase at very low concentrations. Also, through a study of the kinetics, it appears activation occurs by dilution of the substrate concentration. The butyl ester of 2,4-D has been shown to be inactive as an inhibitor for castor bean lipase, and must first be hydrolyzed to the 2,4-D acid for activity.

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A Useful Sectioning Technique

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It is often necessary to obtain sections of biological materials for microscopic examination through particular minute areas, and in rather precise positions. Often the investigator has just one cystocarp of a red alga, a single sclerotium of a fungus, or a small fragment of a valuable type specimen to section. At other times it may be desirable to section fresh aquatic (either fresh-water or marine) material without killing the cells that may remain intact, as in the examination of *Porphyra* or living leaves.

The object to be sectioned, e.g. a tooth of the fungus *Dentinum*, is placed on a microscope slide in a drop of mucilage just large enough to cover it. A specimen 0.5–1.0 mm on a side is sufficiently large, though smaller or larger pieces can be handled with ease. The mucilage should be allowed to dry until when prodded with a dissecting needle the object is motionless, as is the mucilage fracture around the needle. In general, the more nearly dry the mucilage is the better, but it must not become brittle. If the mucilage becomes too brittle that condition may be alleviated by the addition of about 10% glycerine.

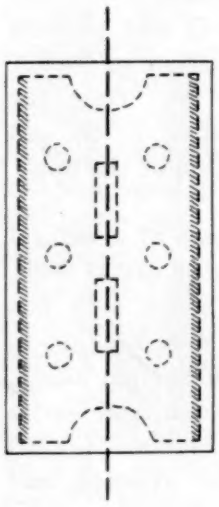

FIG. 1

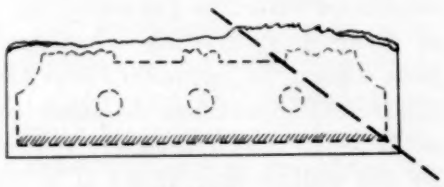

FIG 2

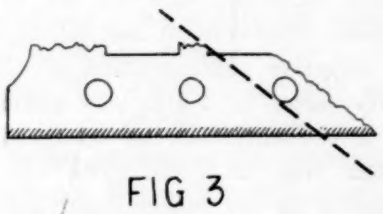

FIG 3

Double-edged razor blades are used for sectioning for several reasons: they are more readily made serviceable, and they have no stiffening edge or back that might obstruct vision or prevent resharpening as shown in Fig. 3. The blades are prepared as follows: While still in the paper package, the blade and the package are broken in half lengthwise (Fig. 1); then one end of a half-blade is broken off obliquely (Fig. 2, broken line) and the paper removed. This procedure produces a pointed blade (Fig. 5) that is very sharp. If a day or so is to elapse between sectioning, it is best to discard the unwrapped blade and start with a newly unwrapped half, as the exposed blades seem to lose their edge. It is essential to have a very sharp cutting edge, and so a further segment of the blade should be broken off parallel to the first "pointing" or oblique break (Fig. 3, broken line) just before sectioning each object.

Sectioning is done on the stage of a dissecting microscope, the stage being nearly at table level, so that there is adequate support for the operator's forearms. A magnification of 10–20 diam is adequate, permitting a sufficiently wide field and ample depth of focus. The object-bearing slide is placed on the microscope stage so that the desired plane of sectioning is oriented about 60° counterclockwise from vertical (i.e., running from about 10 o'clock to about 4 o'clock) in the field of the microscope (Fig. 4), and with the material a little way toward 8 o'clock from the center of the field. Another microscope slide (Fig. 4) is placed over the object as a guide for the razor blade, with the portion of the object to be sectioned half-protruding from under the end of the guide slide. The end of this guide slide should parallel the plane of sectioning and extend to the left (or right for left-handed people). Its right end should be far enough toward 8 o'clock in the microscope field that its end surface can be seen.

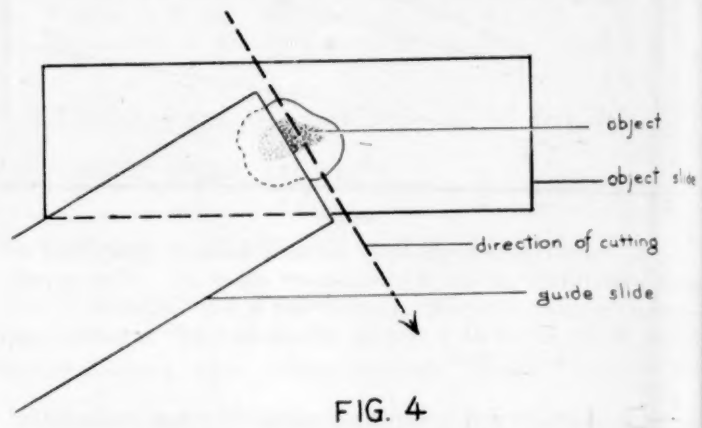

FIG. 4

The guide slide should be held with the left hand and the prepared razor blade in the right hand. Cuts are then made across the mucilage area with the direction of cutting (Fig. 4) from upper left to lower right and with the flat face of the razor blade in contact with the guide slide. The first cuts are made with the razor blade inclined (position 1 in Fig. 5) so that the cutting edge in contact with the object-bearing slide is at a distance

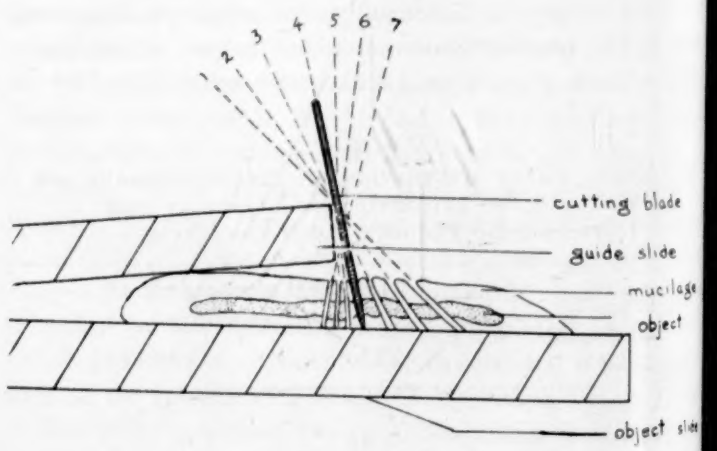

FIG 5

from the end face of the guide slide. Cuts are made clear through the mucilage and object to the glass. With successive cuts the razor blade is brought more nearly erect (positions 1 through 4 in Fig. 5). These cuts bring the razor blade more nearly perpendicular and nearer and nearer to the end face of the guide slide. This procedure controls the thickness of the sections. By the time sufficient sections have been cut to bring the razor blade nearly perpendicular the operator has the feel of the particular object-mucilage mount and of the razor blade. The material should be so placed that the critical sections can now be made by continuing the process of slicing and straightening up the blade with each successive slice (positions 4 through 7 in Fig. 5). The best sections, i.e., the thinnest and most perpendicular, are obtained, as a rule, just when the razor blade is brought perpendicular (position 5 in Fig. 5) and past perpendicular (positions 6 and 7 in Fig. 5) by slanting the razor blade to cut under the guide slide edge.

After slicing is completed through the desired area, the guide slide is removed and a drop of water or dilute glycerine is placed over the mucilage-impregnated sections. In a minute or two the sections will float free, or nearly free, as the mucilage softens. The thick, unsectioned portions of the object may be removed with a dissecting needle and the remaining sections spread about. The sections may then be stained or treated in any manner which may be required.

The technique works equally well with fresh, dried, or preserved materials. Moreover, a section may be obtained with a high degree of success, with almost no equipment, and with a minimum of experience when just one pin-point object is available. Sections have been obtained easily and consistently of materials that are somewhat less than 5 μ thick.

Effect of a Folic Acid Antagonist on Hormonally Induced Changes in the Rat Prostate

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A definite relationship has been demonstrated in the chick between estrogen utilization and folic acid requirement (*1*). That this relationship is not based simply on a general impairment of body growth has been shown by the fact that optimal oviduct responses to stilboestrol occur in riboflavin- and pyridoxine-deficient chicks. In a more recent development, Hertz has found that the tissue growth response of the chick oviduct to stilboestrol can be blocked by the administration of a folic acid antagonist, presumably by competitive displacement of essential folic acid (*2*). This explanation is supported by the observation that the inhibitive effect can be completely reversed by the administration of excess folic acid.

In the course of an investigation into growth mechanisms of the rat prostate,[1] the foregoing findings raised several questions: 1. The use of a folic acid antagonist to inhibit the *stimulating* potential of an estrogen had been clearly shown in the chick. Could the usual *depressant* effect of estrogen on the rat prostate be nullified in a similar manner? 2. If such were the case, was there a possibility that the folic acid antagonist possessed androgenic characteristics *sui generis?* 3. If the antifolic principle did not inhibit the usual effect of the estrogen on the prostate, the probability was good that the blocking action was directed only at that function of the biological activity of the estrogen concerned with tissue growth. If so, might it not therefore inhibit androgen-stimulated growth as well?

TABLE 1

Exp.	Type of rat*	No. used	Average rat wt. in g	Mode of treatment	Average prostate wt. in mg†
	Intact adult	7	201	α-estradiol	190
1	" "	7	231	α-estradiol and aminopterin	373
	Intact adult	5	277	aminopterin	469
2A	Castrate adult	5	238	aminopterin‡	89
	Intact immature	5	62	.....	33
	" "	5	61	testosterone	59
2B	" "	7	54	aminopterin	28
	" "	3	59	testosterone and aminopterin	53
	Castrate adult	5	223	testosterone‡	380
3	" "	5	202	testosterone‡ and aminopterin‡	406

* The adult rats used in these experiments were of the Sherman strain, and ranged in age from 90 to 120 days. The immature rats were obtained from Carworth Farms (Wistar) and were approximately 30 days old.

† Combined weight of anterior (ventral) and posterior lobes, except in Exp. 2B, where only anterior lobes were used.

‡ Begun 24 hr postcastrationally.

The results of experiments designed to test the above hypotheses are summarized in Table 1. It will be seen that: 1. The use of the folic acid antagonist[2] partially,

[1] This study is being done in part under an American Cancer Society grant, recommended by the Committee on Growth of the National Research Council, and in part by a grant from the National Brewing Company. The author would like to extend his thanks to Dr. William Wallace Scott for his kind assistance in this work.

[2] Aminopterin (4-amino pteroyl glutamic acid), a product of the Lederle Laboratories, was kindly furnished by Dr. E. B. Schoenbach, of the Johns Hopkins School of Medicine, who also supplied much valuable information derived from his experiences with the compound. The daily dose used in these experiments was 0.2 mg/kg body weight in aqueous solution. Subcutaneous injections were given for 6–7 days, and the animals were sacrificed 24 hr after the last injection.

if not completely, interfered with the ordinary depressive influence of α-estradiol[3] on the rat prostate. (Table 1, exp. 1.) This finding in a sense confirms, but also extends Hertz' recent observations in the chick (*2*). 2. Furthermore, the folic acid antagonist possessed no androgenic potential itself, as judged by its inability to stimulate prostatic growth in castrate adult, and intact immature rats. (Table 1, exps. 2A and 2B.) 3. Lastly, no interference with androgen[3] stimulation of tissue growth is occasioned by the folic acid antagonist in castrate adult or intact immature rats. (Table 1, exps. 2B and 3.) From this we may reason that folic acid is not a prerequisite for hormonally induced growth in general, but is only essential for the proper utilization of estrogen, either in a stimulant or depressant capacity.

Further investigation of this problem is in progress, using other folic acid antagonists than the one employed here. These studies will be reported subsequently in a paper which will also include complete histological details.

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Metabolism of I^{131} in Severe Anoxic Anoxia

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Clinical reports (*3, 4, 6*) have indicated symptomatic improvement of hyperthyroid patients who sojourn at high altitudes. Rats exposed to severe anoxic conditions demonstrated an oxygen consumption 40–50% of normal (*1, 7*). These results suggest involvement of the thyroid gland in accommodation to anoxia. The present investigation was undertaken to determine whether any significant alterations in metabolism of radioactive iodine could be detected in relatively acute exposures to severe anoxic anoxia.

Eighteen rats were fed a low iodine diet (*5*) for 8 weeks, after which half of the animals served as controls and the other half were exposed to 268 mm Hg air pressure (which stimulated a 27,000-ft altitude) at 15–20° C. The low pressure rats were subjected to this anoxia for 12 hr and were then returned to sea level for injection of I^{131}. Within 3 min they were re-exposed to the low pressure for an additional 24 hr, after which they were sacrificed. The sea level control animals were also kept at 15–20° C and likewise injected with I^{131} 24 hr before they were sacrificed. All injections of radioactive iodine consisted of 10 μc in 0.5 cc of physiological saline (pH = 8.0) administered intraperitoneally. In each rat the total I^{131} was determined in the thyroid gland and in a sample of plasma.

[3] Crystalline α-estradiol and testosterone were obtained through the courtesy of the Schering Corporation. The daily dose of these substances was 0.1 mg in sesame oil; the same injection schedule was used as that for aminopterin.

TABLE 1

FRACTIONATION OF PLASMA RADIOACTIVE IODINE

Experimental conditions	Male rats		Female rats	
	% Plasma I^{131}			
	Filtrate*	Ppt.†	Filtrate*	Ppt.†
Sea level controls	22	78		
	22	78		
	14	86	62	38
	47	53	46	54
	26	75	46	54
avg	26	74	51	49
Anoxic rats	88	12		
	90	10	98	2
	95	5	98	2
	95	5	97	2
avg	91	8	98	2

* Trichloro-acetic acid filtrate.
† Trichrolo-acetic acid precipitate (protein bound fraction).

Plasma I^{131} was fractionated by the addition of 5 volumes of 10% trichloroacetic acid to separate "protein bound" I^{131} (*2*). Urinary excretions from the two groups of male animals were pooled as two samples. The data are summarized in Tables 1 and 2.

The anoxic rats demonstrated a pronounced reduction in protein bound I^{131} in plasma. The average values expressed as percent of plasma I^{131} for male animals were as follows: trichloro-acetic acid filtrate of plasma of control rats 26%, and of the anoxic rats 91%; trichloro-acetic acid precipitate of plasma of control rats 74%, and the anoxic rats 8%. In the case of female rats, the anoxic animals demonstrated an even greater depression of the protein bound I^{131} fraction, but the control values were also somewhat different from those of the male animals. It appears inadvisable to account for the ap-

TABLE 2

DISTRIBUTION OF I^{131} IN URINE, PLASMA AND THYROID GLAND

Experimental conditions	Male (10 rats 170–230 g)			Female (6 rats 140–180 g)		
	% of injected dose I^{131}					
	Total urine (pooled*)	Plasma (1 cc)	Thyroid gland	Total urine	Plasma (1 cc)	Thyroid gland
Sea level controls	30	0.78	76	(Not determined)	0.23	50
		0.64	76		0.23	53
		0.78	40		0.38	
		0.78	55			
		0.57				
		0.14				
avg		0.62	62		0.28	52
Anoxic	22	0.57	53	(Not determined)	0.57	31
		0.64	43		0.67	28
		0.16	46		0.57	28
		0.71	66			
avg		0.52	42		0.60	29

* Pooled urine sample, calculated as % of dose per rat.

parently different results obtained from the two sexes (see Tables 1 and 2).

Table 2 indicates that the influences of anoxia upon I^{131} in unfractionated plasma, in thyroid, or in urine were not as striking as the effect upon protein bound I^{131} of plasma (Table 1).

The data in Table 1 may result from an almost complete suppression of a portion of the thyroid activity under these experimental conditions. More detailed experiments are necessary to substantiate such a conclusion.

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The Use of Detergents for Quantitative Fat Determinations

1. Determination of Fat in Milk[1]

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The determination of fat content has long been an important aid in clinical investigation and in the dairy industry, involving in most instances the use of long, technically difficult procedures and extensive laboratory equipment. Babcock's method and modifications thereof are widely used in the dairy industry because of their comparative simplicity, but even these have certain disadvantages. Sulphuric acid, used in the tests, often causes charring and consequent inaccurate results; caution must be observed in handling the acid and glassware to prevent burns; and as many as three different centrifugations must be carried out for each test. The method outlined in this paper was created to obviate these difficulties.

In this investigation a comparatively new principle is used—formation of a protein-detergent complex to break up emulsions and liberate the fat contained therein. The dispersion principle of detergents was originally used clinically to increase the bactericidal effect of antiseptics (*2*) and is now also used in the laboratory to dissolve sputa for the purpose of isolating and concentrating tubercle bacilli (*3*). The combined solvent action of the two detergents described here has resulted in a very satisfactory method for the determination of fat in milk and shows promise as a universal procedure for the measurement of fat.

[1] Published with the permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the author.

Materials. (A) A supersaturated solution of a fat dye is prepared by mixing 500 mg of oil red 0 in 100 ml of isopropyl alcohol. Two and one-half ml of the clear solution is added to a mixture of 100 g of a standardized nonionic detergent, polyoxyethylene sorbitan monolaurate, and 65 ml of 95% ethyl alcohol, and the new mixture is shaken. (B) The other reagent is a standardized anionic detergent, dioctyl sodium phosphate.

Procedure. (1) A well-mixed sample (17.6 ml) of milk is placed in a Babcock milk bottle. (2) Seven ml of solution (A) is placed in the vessel, which is then shaken immediately to mix the contents intimately. (3) Thirteen ml of reagent (B) is added without further shaking so that this last addition forms a layer at the bottom of the container. (4) The container is immersed in a water bath at 180° F. The water level in the bath should be approximately equal to that in the bottle. (5) After 5 min in the bath, water at 180° F is added to the Babcock flask until the fluid level reaches the top of the graduated portion. (6) The flask is then set aside at room temperature for 10 min, after which the percentage of fat (as in the Babcock test) is read by subtracting the lower meniscus reading from that of the upper meniscus.

One hundred duplicate samples of milk were tested for quantitative fat content. The readings obtained by this method were the same as those resulting from the Babcock test. Detailed comparison of readings obtained with various types of milk, and comparison of methods for cream and ice cream will be presented soon.

The test is based primarily upon three factors: (1) a proper order in mixing of reagents and specimen to obtain maximum effect of the reagents individually and combined; (2) correct proportioning of the reagent emulsion complex by adjusting the quantity of the nonionic detergent to the type of emulsion (milk, ice cream, etc.) from which the fat is to be extracted; and (3) a proper temperature at which the reaction takes place optimally. In addition to these factors, intervals between steps should not be prolonged; the shaking, when prescribed, should be sufficiently thorough to distribute the contents evenly; and the time of reaction should be exact.

Milk fat exists in milk in the form of minute globules constituting a true emulsion of the oil-in-water type, the fat globules being in the dispersed phase. Each globule of fat is surrounded by a very thin film of protein in the serum of the milk, concentrated on the surface and held in place by surface attractions or adsorption. The protein layer may contain some lecithin to form a protein-lecithin layer on the surface of the fat molecule. This concentration of the milk proteins around the fat globule is one factor which assists in maintaining the stability of the fat emulsion in milk.

Dioctyl sodium phosphate is an anionic compound in which the hydrophilic portion is negatively charged. It has a long chain of carbon atoms with a strong polar group located near the center of the carbon chain. With a given chain length of a detergent, the position of the hydrophilic groups is an important variable in the determination of the surface active properties of the resultant

molecule. Dreger and his co-workers (*1*) showed that the activity of detergents increased when the hydrophilic groups were attached near the center of the carbon chain.

Mixing this detergent with milk and heating the combination effects a dispersion of the protein layer around the fat globule, liberating the fat so that it can combine with other fat molecules. However, the separation is not complete. When a quantity of the strongly hydrophilic, nonionic detergent is added to the mixture, a clear solution and complete separation results.

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On the Food Selectivity of Oysters

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The question whether oysters and other closely related mollusks can, in selecting their food, discriminate between the different types of microorganisms has been debated since the end of the last century, but no general agreement has been reached as yet. Among others, Lotsy (*5*) and Grave (*2*) thought that, in their feeding, oysters show a definite selection of particles having food value. Another group, represented by Kellogg (*3*) and Yonge (*7*), maintains that in lamellibranchs the selection of particles is purely quantitative. Yonge (*7*) thinks the main objective of this selection is "the reduction of the quantity of matter passed to the mouth, large particles or many small particles embedded in mucus being rejected and smaller particles or mucus masses passed on to the mouth quite irrespective of their food value."

My observations and experiments make me agree with Lotsy and Grave that oysters (*O. virginica*) do show some selectivity in feeding. In several of our feeding experiments in which yeast cells in very small numbers were added to running sea water many oysters rejected most of the yeast in pseudofeces, while the true feces were composed largely of plankton forms and detritus normally present in our waters (Loosanoff and Engle, *4*). It is significant that the yeast cells were rejected even if their size (about 5 μ diam) was equal or even smaller than that of the many forms ingested by oysters. This clearly indicated that the discrimination against yeast cells was not based upon their size.

Recently I had the opportunity to observe even more striking cases of selectivity shown by oysters in their feeding. In the summer and fall of 1948, during periods when sea water contained relatively little food material, we were adding at a constant rate small quantities of plankton culture to the water flowing into the trays containing experimental oysters. This culture, which was grown outdoors in a 3000-gal wooden tank, contained a variety of different algae, flagellates, and bacteria. The color of the culture was usually light brown or a purple-brown. In feeding this culture to the oysters I noticed that in many cases the pseudofeces formed were purple or pink, while the color of the material that was swallowed by the oysters and passed through the digestive system was greenish-brown.

Microscopic examination showed that the purple pseudofeces consisted principally of a round-shaped form measuring 2 to 3 μ diam. The true feces, on the other hand, consisted of plankton normally present in our water and of relatively small numbers of the purple form. On the basis of morphological examination, this form has been tentatively identified by S. F. Snieszko of our service as being a species of the genus *Chromatium perty*, which contains purple sulfur bacteria.

On several occasions I was able to grow, in flasks, cultures consisting predominantly of chromatia. The cultures developed best if placed near a southern window in strong light. The color of the good cultures was almost purple. When these cultures were added to the greenish-brown cultures fed to the oysters the latter soon formed purple pseudofeces composed largely of chromatia, while the feces remained a normal, greenish-brown color.

I have noticed that the most energetic rejection of the purple form by oysters took place usually during the first few days after it was added to the water. Later on, some of the oysters evidently developed tolerance to this form and ingested it without apparent discrimination. As usual, the oysters showed considerable individual variations in their feeding behavior, i.e., while some of them ingested *Chromatium* within a few hours after it was first added to the water, the others continued to reject it even after several weeks of contact.

Because *Chromatium* is smaller than many other forms ingested by oysters, we cannot ascribe its rejection to its size. It is more probable that as Cobb (*1*) has shown for *Anodonta*, the palps of which responded to a variety of stimuli, including those of a chemical nature, the palps of oysters may possess specialized cells which act as chemoreceptors, and may be sensitive not only to the physical characters of plankton forms, such as their size and shape, but also to their chemical properties. Nelson (*6*) says that feeding of oysters also is a complex process involving the interaction of the muscular, ciliary, secretory, and nervous tissues. Thus, I think, the selection of food may be based in part on the nature of the secretions of different species of microorganisms reaching the palps, and therefore, as the observations on the rejection of chromatia indicate, at least in some instances, oysters can select their food not only quantitatively but also qualitatively.

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Comments and Communications

Two Aspects of the Loyalty Problem

The integrity of science and scientific education in this country is seriously jeopardized, and can be maintained only if scientists generally and the National Research Council in particular are alerted to the dangers inherent in the requirement of clearance and "loyalty" oaths for research fellowships and nonsecret work. Actually the dangers are not confined to science, although they are most acute there. The principle stated by the Congressional interrogators of Dr. Smyth and others is that no one should be educated at public expense who may not be acceptable for government work by the terms of the Federal Loyalty Order—"who would not in the future be eligible to work for the Government in classified fields." This would apply to National Science Foundation fellowships and any other publicly supported grants. In view of the clearance difficulties of some of our most outstanding scientists, and the irresponsible interpretations recently given to routine FBI reports, this condition is manifestly generating fear and insecurity.

An oath unaccompanied by an FBI investigation may sound harmless—an oath of allegiance, as a safeguard against treason, is surely unexceptionable. But an oath covering "past and present membership in various organizations," *under penalty of perjury*, to determine the "subversive and reasonably potentially subversive," is quite another matter, and it is on this that some scientists have compromised. Our Atomic Energy Commission fellows have already been asked to take general and inclusive oaths, subject to interpretations which can only become clear as time goes on. An oath involving the beliefs of both the individual signer and the organizations (whatever "belief" may mean in this case) to which he may belong or which he supports (whatever *that* means), has been written into the National Science Foundation bill now before the House of Representatives. It would be folly to expect that these oaths would not be followed by some sort of investigation, and any attempted guarantee to the contrary would be ridiculous. Oaths of this kind open the possibilities of irresponsible accusations, and of legal procedures based not on acts but on opinions which for one reason or another may not be popular at the moment. The chain of associations is endless. Will the professor be deterred from making recommendations without investigating his student's views, since any difficulties will also involve him? Dare a student study with any nonconformist professor, however brilliant, since he may need simon-pure recommendations?

The words "subversive" and especially "potentially subversive" are variable terms; on the whole they are expanding, becoming more comprehensive, at the present period. According to Senator Hickenlooper, subversive "probably means generally someone who believes in doing substantial harm to our form of government and to our institutions." One could agree unthinkingly, yet only a few years ago a National Science Foundation itself was regarded as an idea considerably to the left of center, and it took a brave scientist to stand up and defend publicly the public support of science. How about national health insurance, and public housing? According to many they will do substantial harm to our institutions, and even to our form of government. And one has only to *believe in* them.

It is a wholesome exercise to remind ourselves that there have been definitions of loyalty quite different from that in current vogue. According to the Connecticut Yankee (italics Mark Twain's):

> You see my kind of loyalty was loyalty to one's country, not to its institutions or its office-holders. The country is the real thing, the substantial thing, the eternal thing; it is the thing to watch over, and care for, and be loyal to; institutions are extraneous, they are its mere clothing, and clothing can wear out, become ragged, cease to be comfortable, cease to protect the body from winter, disease and death. To be loyal to rags, to shout for rags, to worship rags, to die for rags—that is a loyalty of unreason, it is pure animal; it belongs to monarchy, was invented by monarchy; let monarchy keep it. I was from Connecticut, whose Constitution declares "that all political power is inherent in the people, and all free governments are founded on their authority and instituted for their benefit; and that they have *at all times* an undeniable and indefeasible right to *alter their form of government* in such a manner as they may think expedient."
>
> Under that gospel, the citizen who thinks he sees that the commonwealth's political clothes are worn out, and yet holds his peace and does not agitate for a new suit, is disloyal; he is a traitor. That he may be the only one who thinks he sees this decay, does not excuse him; it is his duty to agitate anyway, and it is the duty of the others to vote him down if they do not see the matter as he does.

Of course this is a very radical statement; one would not have to go nearly so far as to act in accord with it to be refused clearance for secret work. We are perhaps not in immediate danger of having Mark Twain barred from school libraries, but we are already afraid of having people take him, or the constitution of Connecticut, too seriously. And unless we resist completely this latest invasion of the personal beliefs of students and their teachers, we are inviting the kind of atmosphere which pervaded Germany in the thirties, stifling academic achievement generally and science in particular.

THEODOR ROSEBURY and MELBA PHILLIPS
American Association of Scientific Workers
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The Scientists' Committee on Loyalty Problems has been studying the loyalty and security clearance procedures of different government agencies for some time.

While these procedures could be improved in many ways, the committee wishes to point out to scientists that they themselves, even under present procedures, can better the situation.

The following proposal aims at raising the level of the confidential reports on which clearance decisions are based. In most investigations, agents of the FBI obtain information from friends, neighbors, and colleagues of the person to be cleared, as well as from less direct sources. The results are collected in a confidential dossier in which the sources of information are often anonymous, or revealed only to a very limited number of officials. It is obvious that these unacknowledgeable statements can cause serious misunderstanding which cannot easily be clarified, especially in cases where the clearance status meets with difficulties.

It is, therefore, strongly recommended that all scientists adhere to the following rules whenever possible: (1) When giving information to loyalty and security investigators, state willingness to testify if necessary. (2) Prepare a signed, written statement of the information for the investigating agency.

SCIENTISTS' COMMITTEE ON LOYALTY PROBLEMS: *Lyman Spitzer, Jr.*, Chairman; *William A. Higinbotham*, Associate Chairman; *Arthur S. Wightman*, Secretary; *Donald E. Hamilton*, Treasurer; *David Bohm, Roy Britten, Robert R. Bush, Elmer G. Butler, Albert Einstein, Luther P. Eisenhart, Samuel A. Goudsmit, M. Stanley Livingston, Stuart Mudd, David Pines, Oswald Veblen, Irving Wolff.*

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The Northern Limit of the Fauna of the African Equatorial Forest

While in the southern Sudan in 1948 with the U. S. Navy Medical Science Group (University of California African Expedition) I gathered material and information concerning the fauna of the forested mountain ranges of the Latuka country in the eastern part of Equatoria Province.

The Imatong Mountains (10,376 feet = 3163 meters) and Didinga Mountains (8935 feet = 2724 meters) are the highest elevations between the mountains of Kenya and Uganda and the highland of Ethiopia. Four species of mammals belonging to the forest fauna have been previously recorded from this area and can now be correctly identified, thus serving as index species for an appraisal of this fauna. They are (1) Black and White Colobus Monkey, *Colobus polykomos occidentalis* Rochebrune (syn. *dodingae* Matschie), (2) Blue Monkey, *Cercopithecus mitis stuhlmanni* Matschie (*otoleucus* Sclater), (3) Bushbuck, *Tragelaphus scriptus delamerei* Pocock (*dodingae* Matschie, *locorinae* Matschie, *barkeri* (Millais), (4) Blue Duiker (*Philantomba monticola aequatorialis* Matschie), (5) From descriptions received locally, although no specimens were obtained, it appears probable that the Black Mangabey (*Cercocebus albigena johnstoni* Lydekker) also occurs.

These forms are subspecifically identical with those occurring in the forests of Uganda and in the Ituri forest. They indicate that the reduction of the continuous forest and the development of the forest islands in the East Nile area are of fairly recent origin. On the other hand the separation of the mountain forests of southern Ethiopia is more remote. The species of this forest fauna are subspecifically distinct from those in the mountains of the Latuka country.

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A Statement of the Governing Board of the A.I.B.S.

For more than a decade, biological scientists and particularly geneticists and cytologists in the USSR have been attacked by so-called "Michurinists," led by T. D. Lysenko, now a high government official and a public figure. Lysenko and his followers have declared the principal attainments of genetics and cytology, including Mendel's laws, to be invalid. This has been done in a manner which shows clearly that Lysenko is either unfamiliar with, or else is willfully ignoring, the basic facts and the methods of investigation of the sciences which he presumes to negate. On the other hand, Lysenko and his adherents have claimed successful experiments with higher organisms demonstrating directed hereditary changes of a useful kind, by means of adaptive responses that later were inherited. Such phenomena would have been of great theoretical and practical value if confirmable. However, outside Lysenko's group in the USSR, such confirmation has proved impossible.

The necessity for clarifying the situation becomes all the greater because Russian spokesmen, such as I. I. Prezent and S. Kaftanov, quote from the works of Western geneticists in support of their views. This Communist party line has even penetrated in subtle ways into reputable weekly and daily journals in France, England, and the United States. The opinion is consequently spreading that modern genetic researches in the West support the official Communist views on heredity. Nothing could be farther from the truth. Authors quoted by the Russians have strongly denied the validity of drawing such conclusions from their studies. In no case has their work discredited or contradicted the firmly established validity of the gene. They resent having their papers cited as leading to such a discrediting, for this is a manifest reversal of their data and of the intent of their statements.

The opinions and claims of Lysenko and his followers have become a matter of especially serious concern to scientists everywhere because the government of the USSR has not only approved and supported the Lysenko group, but has also condemned and suppressed those biologists in the USSR who have disagreed with Lysenko and who have tried to continue their research in the fields of genetics, cytology, and related sciences. As reported in recent months by the world press, and published in the official newspapers of the USSR, the views of Lysenko have been endorsed by the government organs directing scientific research in that country—among them the

Academy of Sciences of the USSR, the Academy of Agricultural Sciences, and the Academy of Medicine. More serious still, geneticists, cytologists, and evolutionists as eminent in their fields and as well known to their colleagues all over the world as Dubinin, Schmalhausen, Zavadovsky, and others have been removed from their positions, deprived of their laboratories, or led to make shameful declarations of their supposed acceptance of Lysenko's view. Finally, the temper of this supposedly scientific controversy may be appreciated by the pronouncements of S. Kaftanov, Minister of Higher Education, to the effect that all anti-Lysenko doctrine must be systematically rooted out of the schools, universities, research institutes, and publishing houses.

It may be left to the judgment of scientists, friends of science, and all fair-minded people to arrive at their own conclusions regarding the propriety of governments and political parties not only deciding a supposedly scientific controversy in favor of one and against another theory, but also dismissing scientists and depriving them of the means of conducting their research, and too often of their lives, because of their adherence to a scientific theory accepted everywhere on this side of the iron curtain. As representatives of American scientific societies devoted to furtherance of research and study in genetics, we feel it our duty to state that the contention raised by Lysenko and his "Michurinists" against genetics does not represent a controversy of two opposing schools of scientific thought. It is in reality a conflict between politics and science. Today the condemned science happens to be genetics. Indeed, the conflict has already spread to other biological fields, and eminent physiologists, embryologists, microbiologists, and others are now being dismissed in the USSR. Tomorrow still other sciences may be proscribed.

The progress of science has always depended upon free inquiry. The inheritance of acquired characteristics, and other doctrines that the Russians now set forth as the official party line, have had their proponents in America; some nongeneticists still hold to these ancient opinions. Nevertheless, they are allowed to investigate or philosophize, and they have a hearing. In Russia, on the other hand, geneticists are being rooted out as dangerous, bourgeois, reactionary, idealist, fascist, regardless of their political views, simply because they, like geneticists everywhere else in the world, know and accept the facts of experimental breeding and microscopic observation which Russian politics has branded false. It is of the utmost importance for the preservation of free inquiry in that part of the world where it still exists that these facts be known and fully appreciated.

The Governing Board of the American Institute of Biological Sciences, an organization representing American societies in numerous fields of biology, is issuing the present statement after consultation with the executive committees of those societies in its organization which deal more particularly with the matters here at issue—namely, the Genetics Society of America and the American Society of Human Genetics. We would sum up our positions in the following propositions:

1. In our opinion the conclusions of Lysenko and his group regarding the inheritance of adaptive responses in higher organisms have no support in scientific fact.

2. Genetic researches definitely support the reality of the gene and the validity of Mendel's laws. They do not support the official Communist claim that Mendelian heredity is an illusion, and any attempts on the part of Russian proponents of the Lysenko doctrines to bolster their case by citations from the works or conclusions of Western scientists are gross distortions of the meaning and intent of these scientists.

3. We condemn the action of the Soviet government in presuming to banish a firmly established science from its schools, publishing houses, and research laboratories, and in persecuting scientists because their field of inquiry is distasteful to the government.

E. G. BUTLER
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Executive Committee

Governing Board
American Institute of Biological Sciences

S. 1703 and the Antivivisectionists

Science will probably lose by default its present legislative battle against one of its most vocal and powerful enemies—the antivivisection cult.

Representatives from twenty-six national health and science groups, local hospitals, universities, lay groups, and governmental agencies met in Washington the second week of July to discuss the political future of Senate Bill 1703, medical science's first Congressional broadside against the antivivisectionists.

Specifically, the bill would enable District of Columbia scientific institutions to utilize a portion of the seven to ten thousand unclaimed and unwanted animals now annually destroyed in the District pound. The experimental use of these dogs which would otherwise be uselessly killed could speed research and teaching in the universities and government agencies of the nation's capital.

The bill applies to the District of Columbia only. Actually, however, because of its precedent-establishing nature, the legislation is of national importance.

A. C. Ivy, secretary-treasurer of the National Society for Medical Research, reported to the Washington meeting that a recent legislative conference revealed the bill would probably remain in committee because scientists and the friends of science have failed to express themselves on the matter. Dr. Ivy pointed out that members of the special Senate subcommittee to which the bill was referred are personally in favor of the bill, but that an organized flood of antivivisectionist mail has introduced political complications.

Senator Margaret Chase Smith of Maine, the chairman of the subcommittee, has received the brunt of the antivivisectionist pressure. Although she recognizes the

great need for the bill's enactment, Senator Smith apparently regards the measure as a political "hot potato" and hopes to avoid political pressure from the small-numbered but extremely militant antivisisectionists by keeping the bill in committee. Senator J. Howard McGrath of Rhode Island, another subcommitee member, who introduced S. 1703, has also been subjected to antivivisectionist political pressure.

Scientists and their friends should write to Senator McGrath supporting S. 1703 and to Senator Smith urging the subcommittee to recommend the bill.

As Dr. Ivy said, "The preposterous and dangerous situation which the antivivisection movement has produced is really the scientist's fault. Our lack of effort in the past has enabled the antivivisectionists to achieve their present restrictions on research and teaching. It would be more than a tragedy if further inertia were to continue and this important legislation suffer a defeat."

BRUCE SHELLY

National Society for Medical Research, Chicago

On the Application of Scientific Procedure to the Social Sciences

In a letter published in *Science* (March 18, 1949) Edgar G. Miller, Jr., says "Science is not any particular method or set of techniques. It is a way of reasoning. The standards are intellectual rather than procedural." These statements are part of an argument showing that it is wrong to criticize the social sciences on the ground that they do not use the "procedural" methods of natural science. The writer says further that "the validity of the scientific method is not confined to any one procedure."

I believe this is a misapprehension. Natural scientists have discovered, rather late in history, that science can progress only if it is made impersonal and objective. Observations of facts in nature have to be independent of the observer—of his language, race, religion, intellectual power, and above all his motives. The "procedure" for ensuring this is simply to require that any fact be observable or demonstrable at all times to anyone, before it is admitted as a part of science. Only since enforcement of this procedure has science truly grown; and, conversely, if it were relaxed science would retrogress to the days of alchemy and astrology. This applies to descriptive sciences like geology as well as to laboratory sciences like chemistry. The facts of descriptive science must be demonstrable. Any hypothesis which may be constructed must be labeled as such; it must be held plausible only as it codifies observations, and useful only as it leads to further observations. Until it is rigorously—procedurally—checked, it may not be used in demonstrations, simply because that would be assuming what is to be proved. It is only thus that science can purge itself of errors—especially errors stemming from the desire to prove something preconceived rather than to ascertain the truth.

It does not follow that the intellectual tools of science—hypothesis before the fact, and logic after it—are unimportant. It is just that they are not sufficient. Logic and hypothesis existed long before science made any serious progress. The theologies and philosophical schools that flourished in the predemonstration days were the work of men whose intellect and imagination were as good as our own. Their hypotheses were brilliant, their logic profound and subtle. Their common defect was simply that they did not check their premises by observation. The consequence was that their systems of thought were generally of low usefulness as descriptions of nature or as bases for scientific advance. The writings of Aristotle furnish plenty of classical examples in illustration. What is proved by thinking depends on the premises, and if the premises are arbitrary or unrelated to nature the conclusions will be the same. Such pursuits as chess playing and theology have intellectual standards as exacting as those of natural science, but they are not science, because they have nothing to do with nature, and may exist purely in the mind. It was not until thinkers applied the criterion—procedure—of checking their teachings one by one against observation, and excluding from science anything that could not be so checked, that the success and prestige of present-day science could begin to grow.

All this does not mean that further effort in the social sciences is useless unless they confine themselves to the observational method. In history, for example, it is impossible to use the critical procedure of physics or chemistry. That does not prove that history is not a useful or rewarding study; a thorough knowledge of history on the part of today's citizens might benefit humanity more than the know-how of rockets and atom bombs. It does prove that history is not a natural science, and that a prediction of future events, or even a recital of past ones, is and remains an opinion judicially based on limited evidence, instead of an objective fact to be built on with confidence. The modern social sciences are in a somewhat different position; many of their teachings are objective and demonstrable. But many others are not, and perhaps never will be; and failure to differentiate between fact and hypothesis can serve only to debase future work in the field. The consensus of scientific thought will be, I think, that social science may best advance by checking as many of its teachings as possible against experiment and observation, and rigidly separating these from the teachings that are as yet unconfirmed by critical procedure and are therefore still hypotheses or assumptions—to be regarded as *useful* instead of *true*, and above all to be treated with the impersonal skepticism of the scientist instead of the interested faith of the prophet.

FREDERICK ROMBERG

Austin, Texas

Book Reviews

Our sun. Donald H. Menzel. The Harvard Books on Astronomy. Philadelphia: The Blakiston Company, 1949. Pp. 326. $4.50.

One of Dr. Menzel's principal contributions to astrophysical thought has been his insistence, often in the face of opposition, that the stars must not be regarded as static formations, but rather as turbulent masses of gas whose outer layers are constantly moving about in different directions, giving rise to tremendous prominences, extended atmospheres, coronas, and various types of corpuscular radiations. His new book on the sun shows why he has maintained this picture of a star. There is every reason to believe that the sun is not unusual and that its prominences, spots, flocculi, and flares are regular properties of most stars.

The book is full of useful and up-to-date information. The first eight chapters describe the various features of the solar surface, including recent developments in infrared spectroscopy at the University of Michigan and elsewhere. The problem of the spicules recently discussed at the Harvard High Altitude Observatory in Climax is treated in detail, as are also the new results on prominences derived by means of moving picture cameras.

Chapter 9 is an account of the corona and gives a thorough discussion of Edlén's identification of the coronal lines and of Lyot's work on the shape of the corona. There is a section devoted to the solar radio noise, and a discussion of the theoretical implications of the high temperature of the corona.

Chapter 10 discusses the structure of the interior of the sun and the now generally accepted ideas of the source of the solar energy. Only one page is devoted to the origin of the solar system, probably because this topic was previously discussed by F. L. Whipple in his book *The earth, moon and planets*—another issue of the Harvard series.

Chapter 11 deals with the eclipses of the sun and records many personal experiences and observations of the author. Incidentally, the results of Van Biesbroeck's measurement of the relativity shift in 1947 have been known for some time. The value, as published in the *Astronomical Journal*, No. 1175, page 71, 1948, is $2.01 \pm 0.18''$.

The last chapter is devoted to those terrestrial effects which are correlated with solar phenomena. The illustrations are numerous and are exceptionally good, but Fig. 149, showing the Doppler effect of the recession of the spiral nebulae, although often used in various recent publications, is so heavily retouched that it gives an altogether erroneous impression of the spectral lines. The curve of growth shown in Fig. 59, although copied from another publication, is grossly misleading and should certainly be replaced by a more accurate diagram when this book is revised for a second edition.

Most readers will be surprised that Hale's great work on the sun is comparatively little recognized. For example, his invention of the spectroheliograph is dismissed in two sentences, and the enormous productivity of his own research and of that of his associates at the Kenwood, Yerkes, and Mount Wilson Observatories has not been accentuated, but has rather been submerged in the great mass of more recent advances. Despite these minor criticisms, the book is an important addition to the astrophysical literature. It is primarily intended for the amateurs, but professional astrophysicists will also find it a valuable and interesting summary of modern solar physics.

OTTO STRUVE

Yerkes Observatory

Embryology. Lester George Barth. New York: The Dryden Press, 1949. Pp. viii + 330. (Illustrated). $5.00.

In the pedagogical realm, no science deserves more or has received less from its practitioners than embryology. No biological field offers more drama and excitement than the one which treats of the transformation of a simple, tiny egg into a complex being. Yet most textbooks of embryology in use today are calculated to give the student the impression that embryology is the deadest of the sciences. It is a pleasure to record that this situation has just been altered by the appearance of a college-level text in which development is analyzed as well as described. The book is *Embryology,* by L. G. Barth of Columbia University.

The book opens with a brief but compelling statement of the problems of embryology. The viewpoint indeed is primarily analytical throughout. For example, the experimental work on the make-up of the unfertilized egg, on gastrulation and the organizer, and on the gradual differentiation in the neurula stages, is dealt with before the actual development of the frog's egg is described. Moreover, although there are chapters specifically devoted to the traditional chick embryo and to the mammal, the author also draws on hydroids, flatworms, and echinoderms where they are useful in illustrating principles.

The order of topics is roughly chronological, beginning with ovulation and proceeding to the later phases of development, where the several organ systems are considered separately. In addition to the material conventionally treated in embryology texts, however, this book also deals with fertilization, regeneration, growth, sex differentiation, and embryonic physiology. In all cases an analytical approach is adopted wherever the material allows it, the tone throughout being critical and inquiring. The style, moreover, is clear and terse. It will be a poor student indeed who is not stimulated by the whole presentation.

Prof. Barth has no doubt done a brilliant job of reporting on an extremely broad field. In too many places, however, the coverage is superficial. Thus the difficult subject of avian gastrulation is dealt with in less than a page and a half, with no adequate illustrations; the visceral pouches are dismissed as "five evaginations from the side walls of the foregut"; embryonic excretion is glossed over in 160 words. Such superficiality particularly afflicts the descriptive sections, for the reason, the author says, that "the details of comparative and descriptive embryology are of specialized interest"! Why experimental embryology is less specialized than descriptive he does not explain, nor does he make it clear by what sort of transmigration a true understanding of experimental problems is to be conveyed into minds with the slipshod grounding in morphogenesis that he proposes.

But the principal weakness of the book lies in the illustrations. The line drawings range from poor to grotesque. At best they are too schematic; at worst they are the sort of graphic enigmas that can be resolved only by a practiced eye—and not always by that. Many are ill-proportioned and inaccurate in detail. It is difficult to see how the importance of exactness in observation and recording is to be impressed on students if they find such sloppy work in print. There are numerous photographs, but most of these are not very clear, despite the use throughout of glossy coated stock that makes the book hard to read. The detailed descriptive captions, however, are generally excellent.

That the book has shortcomings I record with regret, and in the hope that they will be corrected in a second edition. For the work is a most valuable contribution to the teaching of embryology. No other text comes close to it in laying before the undergraduate student the living, growing body of knowledge that is embryology.

FLORENCE MOOG

Washington University

The theory of solutions of high polymers. A. R. Miller. New York: Oxford Univ. Press, 1948. Pp. vi + 117. $3.25.

This small volume treats a very timely and important subject in a highly scientific and thorough manner; it is not a book for a man who wants to get a first general idea of the matter but it is an excellent, up-to-date presentation of our present ideas of the nature of macromolecular solutions and the modern ideas and mathematical methods used to represent their behavior in a quantitative manner.

After a short introduction dealing with the principles of statistical mechanics and a little information on the most important properties of macromolecules, the author proceeds to treat his main subject—namely, the statistical treatment of flexible long chain molecules in athermal solutions. This is done in a rigorous and general manner, yet the text always has great clarity and convincing simplicity.

A chapter on comparison of theory with experiment and another on treatment of solutions with appreciable heat of mixing complete the presentation of our present-day knowledge. A very stimulating chapter on possible extensions of the theory concludes the book, which is a valuable addition to the scientific literature and a masterpiece of clear and concise writing.

H. MARK

Polytechnic Institute of Brooklyn

Motor performance and growth: a developmental study of static dynamometric strength. Harold E. Jones. Berkeley and Los Angeles: Univ. California Press, 1949. Pp. x + 181. (Illustrated.) $2.00 paperbound, $3.00 cloth.

This painstaking research study is one of the few longitudinal studies in which the same individuals have been measured biannually from the 6th through the 12th grade, 11 to 17.5 years of age. The primary data include 139 middle-class students, divided about equally as to boys and girls from five elementary schools of Oakland, California. The measures consist mainly of static right and left grip, push and pull *dynamometer strength*. The significance of strength is shown in the large coefficients of variation during the adolescent growth spurt, these being greater than for any other physical or psychometric measures. The testing procedures are judged to have been good, since the reliability coefficients were .938 or above for the boys and .901 and above for the girls.

The selection of tests was dominated by convenience. Higher validities may be shown for the net contribution of leg strength to all-around athletic performance (Rogers' Montclair High School Data) and the superior validity of the dynamic tests over the static type is frankly acknowledged. Correlations are quoted from Espenschade's work (1940) to show that right grip and total strength correlate .50 and .34, respectively, with a track dash, .44 and .56 with the broad jump, .53 and .62 with a distance throw; low correlations of .27 and .29 are quoted for relationship to the jump and reach test and insignificant correlations are shown for the Brace motor ability test. To some considerable extent the book is a collaboration of several articles published in educational journals. Whereas total strength correlated .39 with age, .50 with skeletal age, .65 with height, .30 with popularity, .21 with good looks, insignificant correlations are shown for intelligence and socioeconomic status. Other authors (Bower, Jersild, Dimock) are quoted to sustain the role of strength in social leadership (reputation) and in athletics (Rogers, McCloy, Cureton).

As a whole the study confirms, on the basis of four types of growth causes, the studies of others to verify the prepubertal lag followed by the growth spurt, the differences between boys and girls after 13 years of age, and variable patterns of growth for early contrasted with late maturing cases. Tables of strength are given for each half-year of age from 11 to 17.5 years. Jones concludes that strength is superior to the shock creative test, the Crampton pubic hair method, or any other known method. It shows that early maturing boys and girls usually have greater total strength but in the early maturing girls there appears to be an arrest of growth that

does not develop in the boys. The finding that the greatest growth for both boys and girls occurs in April and the least in October seems real but it is not well explained. This is in direct opposition to the findings in various weight studies, which show the greatest increase in the second half of the year.

The generalizations of the author as to educational implications are dominated by the belief that strength is almost wholly inherited and little credit is given to developmental or environmental influences. The author seems to have some prejudice against intensively competitive games and athletics in general, which is unsupported by data. The positive aspects of guidance are relatively undeveloped, although opinions and inferences abound in the final chapter which go beyond the meaning of the data, since no methods for developing strength have been tested.

THOMAS K. CURETON, JR.
University of Illinois, Urbana

Fieldbook of natural history. E. Laurence Palmer. New York: McGraw-Hill, 1949. Pp. x + 664. (Illustrated.) $5.00.

"Professor Palmer's *Fieldbook* is an extraordinarily comprehensive guide to natural history. Simply presented, and profusely illustrated, it embraces more than two thousand items—birds, fish, plants, rocks and minerals, the stars, mollusks, reptiles, and mammals. Each item is illustrated with a detailed drawing or photograph for quick and correct identification, and for each there is a descriptive paragraph, followed by data on range and location, life history, ecology, and economic importance. An unusual feature of the book is its inclusion of many domesticated and economically important species not usually found in books of this kind."

This quotation from an advance notice released by the publisher of the *Fieldbook* proves to be an accurate description. Here is encyclopedic information about a wide variety of subjects. It bids fair to become one of the most frequently used books on the desks of teachers, high school and college students, naturalists, game managers, game protectors, gardeners, nature lovers, sportsmen, and citizens generally who want to know something about their surroundings. The book should give a real impetus to efforts toward conservation education.

One doesn't have to be a specialist to use this book. Technical terms have been avoided. But the information is exact and can be referred to in its place in the taxonomic scale.

Most useful will be the drawings. While this book lacks conventional keys (which ordinarily cannot be used except by specialists anyway) there are hundreds of distinctive line drawings so that identification of plants, birds, or insects should be a comparatively simple matter. It is true that some of the outlines do not look just right, but this applies to few, and is by no means strange in view of the comprehensive coverage of the work. If colors could have been used the illustrations would have been somewhat more useful.

This reviewer has often wondered why, in our books on mammals and other species, we should not include the domesticated varieties, including man (although perhaps it is stretching a point to call man domesticated!). The *Fieldbook* does this, with excellent results.

Unfortunately, the author follows the American Ornithologists' Union Check-List in the use of the possessive, as "Gambel's quail" instead of the Gambel quail—as strained a usage as it would be to say "Vancouver's Island" or "Rainier's Mountain." The author cannot be too much blamed, however, since probably the majority of usage in ornithology, at least, follows this cumbersome practice.

In a work covering so large a field in natural history, it is inevitable that omissions should occur. Among these we note the absence of bicolor lespedeza and multiflora rose among plants. Since so many gardeners and game managers all over the country are concerning themselves with these species, with a zeal that smacks of a full-fledged fad in wildlife management, there are sure to be information-seekers who will be disappointed not to find them in this volume. But in general the material has been well selected and one would be captious indeed to press this comment.

The book is typographically attractive and accurate. Furthermore, it is equipped with a complete index which will greatly facilitate its use.

Another virtue of this book is that it is authoritative—experts have checked the facts. This is unlike some other recent works whose authors appear not to have taken the trouble to check their information with specialists.

The *Fieldbook of natural history* represents another major contribution from the splendid Cornell group of scientific leaders among whom the Comstocks, Needham, Bailey, the Wrights, Allen, and Hamilton are included. The volume is a great credit, both to the author and to the publishers. Furthermore, the reviewer cannot forbear to mention the price. Five dollars for this book of 664 pages is not only astonishing, but gratifying. The job is a public service which ought to be appreciated by all and will be by many.

W. P. TAYLOR
Stillwater, Oklahoma

Theory of oscillations. A. A. Andronow and C. E. Chaikin. (Solomon Lefschetz, ed.) Princeton, N. J.: Princeton Univ. Press, 1949. Pp. ix + 358. (Illustrated.) $6.00.

The original version of this book was published in Russian in 1937, and parts of it were included in Minorsky's *Introduction to non-linear mechanics,* first published in the David Taylor Model Basin Reports during the war. It is concerned with oscillations in autonomous systems, in particular systems representable by equations of the form

$$\dot{x} = P(x, y), \quad \dot{y} = Q(x, y), \tag{1}$$

including the second order equation $\ddot{x} + x = \mu f(x, \dot{x})$, which is reduced to (1) by putting $\dot{x} = y$. These equations are treated mainly by considering the path of the representative point in the x, y or *phase* plane, using the Poin-

caré-Bendiron theory of singular points and limit cycles; some graphical methods and the van der Pol and Poincaré methods of approximation are also included. The first chapter introduces some of the main ideas by means of linear oscillations, but the rest of the book is devoted to the nonlinear theory. There are many examples taken from electrical and mechanical systems.

The authors here, and even more in the original, seem to be interested primarily in obtaining geometrical configurations, secondarily in the stability of electric circuits and mechanical systems, and comparatively little in accurate quantitative estimates for periods and amplitudes. We must be grateful to the editor for condensing the mathematical machinery, which goes much beyond possible applications. So far as I can see, from a very brief glance at the original, considerable sections have been rewritten, and the notation has been clarified in many places. The supplement with the oscillographs shown in Minorsky has been omitted, the introduction has been drastically cut and also the list of references, although it contains some new ones. Appendices B and C contain material from other sources, but the proof in B does not cover such a long time interval as the one it replaces.

MARY L. CARTWRIGHT

Girton College, Cambridge, England

Venins de serpents et antivenins. (Collection de l'Institut Pasteur.) P. Bocquet. Paris: Flammarion, 1948. 157 pp.

This book offers the reviewer a fine opportunity to make philosophical observations about biological phenomena, and biological observations about philosophical phenomena. Reading the first chapter, which briefly reviews facts that are common knowledge, one wonders how the snake came to be both dreaded and worshiped. It had fundamental significance in mythology and religion, it has been linked with death and immortality, and it was made the symbol of the eternal striving of mankind to explain itself. On the other hand, one wonders about what sort of vagaries and intricacies in the evolutionary process joined in the salivary secretions of snakes substances endowed with such powerful physiological and pathological effects—effects studied by specialists in fields ranging from neurophysiology to acute, invasive infection.

The obvious truth that a thorough analysis of any biological phenomenon must of necessity take a student from his own specialized field into broader and more fundamental spheres seems to find its clearest example in snake venoms, which are a challenge to limitation, and an invitation to universality in biological thought. This is, no doubt, the reason why such illustrious names as Claude Bernard, Delezenne, Weir Mitchell, Calmette, and Arthus are associated with the history of research on snake venoms, and this is why in our days venoms are assiduously studied by penetrating minds. It looks, indeed, as if the amazing properties of snake venoms had the same fascinating effect on the mind of the modern biologist as they had on the mind of the primitive man.

There was an urgent need for a book such as the one written by P. Bocquet, because those published in the past by Calmette and Physalix in France, Noguchi in the United States, Belfanti and Fracassini in Italy, Picado in Costa Rica, and still others, valuable as they are, are now dated. The book, which can be read in a few hours, is divided into 14 chapters. The first chapter offers pertinent historical data; the next four chapters deal with the toxic secretions in the animal scale, anatomy and function of the poison glands, and the natural and experimental poisoning. The sixth chapter, which is the longest, reviews first the effects of venoms on the nervous, muscular, and circulatory system, on the blood, and on cells and tissues. Then it analyzes the varied enzymatic content in the poisonous secretions, and finally it studies the action of different venoms on microorganisms, vegetal cells, and enzymes. The three following chapters consider the effects of physical and chemical agents on venoms, the chemical constitution of venoms, and variations in their toxicity, as depending on geographical and seasonal factors. The tenth chapter deals with the classification of the venoms. The last four chapters are concerned with problems of natural and acquired immunity, and the preparation of antipoisonous sera; with treatment of snake bite; and finally, with the therapeutic applications of snake venoms. The many subjects approached are treated in an authoritative manner and with characteristic French clarity. The author discusses the effects of snake venoms on the nervous, circulatory, digestive or respiratory system with perfect mastery of the sciences of physiology and pharmacology, and his classification of venoms in relation to other toxins, enzymes, and poisons shows an excellent knowledge of toxicology and bacteriology. Also, his analysis of the phenomena of natural and acquired immunity reveals a solid background in immunology, as do the precise directions for the preparation of efficient antivenimous sera.

To understand how the author, still a young man, could have accomplished his task as successfully as he did, one must remember that he has lived all his life in the atmosphere of the Pasteur Institute of Paris. Paul Bocquet is the son of an illustrious Pasteurian, Alfred Bocquet, to whom the book is dedicated and who, in turn, was the closest collaboratory of A. Calmette, the head of the brilliant School of Tuberculosis of the Pasteur Institute, and the discoverer, more than forty years ago, of the antiophidean serum-therapy. The author is himself the present head of this department at the Pasteur Institute. Bordet, still another brilliant member of Pasteur's school, reminds the reader of all these circumstances in the foreword he has written for the book.

This book, therefore, besides being the expression of an individual effort, is an exponent of continuity of one of the most brilliant schools in biological thought of the last seventy years. Bocquet's name is to be ranged with the names of so many other workers of the present Pasteur Institute who indefatigably persevere along a great tradition despite almost overwhelming financial odds and political events too recent to need recounting.

F. DURAN-REYNALS

Yale University School of Medicine

NEWS and Notes

C. Lovatt Evans will retire this summer from his position as Jodrell Professor of Physiology, University College, London, which he has held since 1926. His publications include a series of *Recent Advances in Physiology* and a textbook on human physiology. Since the death of E. H. Starling Dr. Evans has edited Starling's *Principles of Physiology*, now in its tenth edition.

N. Ercoli, director of biological research at the Warner Institute for Therapeutic Research, New York City, will assume the direction of the Istituto Sieroterapico Milanese, Milan, Italy, in September.

E. S. Moore, head of the Department of Geological Sciences, University of Toronto, retired June 30 with the title professor emeritus, after 27 years on the staff.

Donald Woernley, physicist with the American Optical Company, has joined the staff of the Roswell Park Memorial Institute, Buffalo, New York, where he will conduct research in cancer biophysics.

Milton V. Veldee, chief of the Public Health Service's laboratory of biologics control, will retire after nearly 30 years of service with the agency. Dr. Veldee will be succeeded by his assistant, **William G. Workman,** who has been with the National Institutes of Health for the past 18 years.

G. M. Watkins, mycologist at the U. S. Naval Ordnance Laboratory, has been appointed professor of plant pathology in the Department of Plant Physiology and Pathology at Texas Agricultural and Mechanical College.

J. Eldred Hedrick, senior technologist of the Shell Chemical Corporation, has been appointed a professor of chemical engineering at Cornell University, effective this month.

Ismael Vélez, professor of botany at the Polytechnic Institute of Puerto Rico, will conduct research during 1949–50 on the herbaceous vegetation of the Caribbean Archipelago under a Guggenheim fellowship. During the year, Dr. Vélez will visit the herbaria of Washington, D. C., New York, and Chicago.

Grants and Awards

The National Institutes of Health Division of Research Grants and Fellowships is being reorganized. A new section on arthritis and rheumatism has been established and another on morphology and genetics; the sections on antibiotics, tuberculosis, and syphilis have been merged into a single section on experimental therapeutics; the panel on malaria has been abolished and its functions will be taken over by the tropical medicine section; the bacteriology section will now be known as the section on microbiology and immunology, and the sanitation study section as environmental health. The study section on gerontology has been discontinued because so few applications for grants were received, and the radiobiology section is no longer necessary since most radiobiology applications now go to the Atomic Energy Commission. The sections, whose members meet periodically to consider applications for research grants-in-aid, have been reduced in number from 20 to 17. *August 1* is the deadline for applications to be considered at September–October meetings of the sections; *December 1* for January–February meetings, and *April 1* for the May–June meetings.

The American Academy of Arts and Sciences announces that income from its Permanent Science Fund will be disbursed as grants-in-aid in support of research projects, which may be in any field of science.

Requests for further information about conditions governing the grants should be addressed to Hudson Hoagland, Chairman, Permanent Science Fund Committee, Worcester Foundation for Experimental Biology, 222 Maple Avenue, Shrewsbury, Massachusetts. Applications will be considered on *March 1* and *October 1* of each year.

The Research Corporation has announced the recent distribution of grants-in-aid for scientific research amounting to $235,000 for the initiation and continuation of 64 research projects administered by colleges, universities, and scientific institutions in the U. S. This brings the year's total of grants to $650,000, for a range of projects including cosmic ray research, construction of a mass spectrometer, studies of the structure if proteins, total synthesis of morphine, photochemical reactions, electrodeposition of metals, and various studies of metal alloys.

Colleges and Universities

Purdue University's new Department of Biological Sciences, which replaces the former Department of Biology, includes three major divisions: bacteriology, botany, and zoology and animal husbandry. John S. Karling, formerly of Columbia University, is head of the department and P. A. Tetrault, A. T. Guard, and C. J. Goodnight, respectively, are chairmen of the divisions. M. X. Zarrow, of Harvard University, and Dorothy M. Powelson, of the University of Maine, have been appointed professors of endocrinology and bacteriology, respectively, effective July 1st. A fourth division of biophysics is being organized jointly with the Department of Physics and will be under the direction of Lorin J. Mullins of Johns Hopkins University, who has been appointed professor of biophysics.

The Institute of Science and Technology of the University of Arkansas will conduct research on a contract basis for the Atomic Energy Commission on the chemical effects of nuclear transformations. The contract consideration for the first year is $25,000. Under the contract, an effort will be made to utilize hot atom exchange reactions in the preparation of tracer compounds, particularly those useful in medical and biological research. The project will also include a study of the chemical effects of beta decay processes. Raymond R. Edwards,

associate chemist in charge of nuclear studies in the institute, will head the project and will be assisted by Paul L. Day and John R. Totter of the School of Medicine's Department of Biochemistry.

Smith College announces receipt of a grant from the National Cancer Institute of the U. S. Public Health Service in support of the studies being carried on by the Smith College Genetics Experiment Station on ovular tumors, which prevent wide species crosses. The Genetics Experiment Station, established in 1942, has given M.A. degrees to seven graduate students and Ph.D. degrees to three. Through grants from other foundations it has been carrying on research and graduate instruction in plant cytogenetics, methods of embryo culture, and other controls of evolution and life processes in plants, with special reference to horticultural practice. The scientific staff consists of Albert F. Blakeslee, director, Sophie Satin, assistant director, Amos G. Avery, associate geneticist, and Jacob Rappaport, plant physiologist.

Young women with a bachelor degree who desire to work in the Genetics Experiment Station toward an advanced degree should apply to the Director, Smith College, Northampton, Massachusetts. For the coming academic year there are available one full-time assistantship at $2,000 and two part-time graduate assistantships at $1,000, plus tuition. Opportunities are available for apprentice training in plant breeding with academic credit during the summer.

The **California Institute of Technology** is planning construction of a new earthquake-resistant, concrete-reinforced engineering laboratory, at a total cost of approximately $625,000 when equipped. All of the civil engineering section will be moved to the new building, which will also house laboratories for such projects as powder metallurgy, X-ray metallography, spectrographic analysis, metals preparations, and use of radioactive isotopes in the study of materials. There will be a thermodynamics laboratory, one for strength and materials research, another for earthquake studies and for vibration investigations, and space for offices and classrooms.

Meetings and Elections

Science Abstracting. Over 1,850,000 scientific articles are published each year throughout the world. Only one-third of them are abstracted and thus made available in convenient form for a wide audience of scientists. These are abstracted, on the average, three times; the rest are not abstracted at all. The International Conference on Science Abstracting was convened by the Department of Natural Sciences of Unesco to examine this situation and consider what could be done to improve it.

Under the able chairmanship of Alexander King, of Great Britain, and with the efficient organizational technique of J. B. Reid, Unesco's Program Specialist for Scientific Literature, the conference met in Paris June 20–25. There were present 62 voting delegates from 28 countries and 24 international scientific organizations, together with 85 observers, making a total of 147 representatives from 29 countries.

The resolutions adopted in the final plenary session of the conference include many items of considerable significance to the advance of science in coming years. As would be expected, it was recommended that Unesco continue its efforts to promote the free interchange of scientific literature among the different countries, inasmuch as the complete coverage by abstracts of all new scientific information depends on that freedom. To facilitate the use of foreign literature in each country, it was recommended that adequate bilingual or polyglot dictionaries should be provided for all fields of science and technology, taking into account the national variations in usage and, if possible, making use of illustrations.

The secretariat of Unesco was urged to promote, in collaboration with the international scientific unions or other appropriate bodies, the standardization of scientific terminology and the publication at appropriate intervals of lists of new terms, with translations in various languages. Especially, in view of the urgent need for detailed evalution of the various systems proposed for chemical notation, the conference voted that the International Union of Chemistry and other organizations concerned with that problem be notified of the importance attached to it by the conference. The members were thinking not only of the primary use of symbols and words in recording data but also of their applications to the indexing of abstracts. Throughout many a discussion, one would recognize the general eagerness for more comprehensive standardization of terminology and publication procedures.

Several good suggestions were directed at the editors of scientific journals. It was agreed that each issue of such journals should include synopses of all its original articles. These should be in English or French, if not also in other languages, and the editor should accept responsibility for their adequacy, whether or not prepared by the author. The *Guide for the preparation of synopses,* prepared by the Abstracting Services Consultative Committee and issued by the Royal Society, Burlington House, London, was suggested as a basis for a standard guide that should be prepared for the use of authors and editors. Further, it was recommended that if a paper is not the publication of an original work, editorial symbols should be used to indicate whether it is a review, a discussion or criticism of previously published work, or a technological application of basis data. Most important of all, there was a strong expression of hope that synopses would be made freely available for republication by abstracting services in spite of copyright provisions of original journals.

Attention was directed toward the desirability of the establishment of regional bibliographical centers with facilities that would be used in locating periodicals, books, theses and laboratory reports obtainable within the region. The hope was also expressed that such centers be equipped for the production and distribution of photocopies, either full scale or microfilm. Scientists and scientific publishing bodies may find it desirable to set up, in cooperation with national or

regional committees, subject committees on an international level to coordinate abstracting in such major fields of pure and applied science as physics, chemistry, mathematics, engineering, and agriculture. Unesco was therefore asked to invite appropriate international organizations, such as the several international scientific unions, to facilitate the formation of these subject committees and their liaison with each other.

In keeping with the well-known objectives of Unesco, the conference consistently aimed toward coordination and cooperation between the numerous bodies now concerned with science abstracting, and the extension of their activities within the broad domain of science and technology. But most significantly, its findings and recommendations were also directed toward a much more complete geographical coverage in order that the results of research and development might be far more widely distributed and shared than at present. There seems little doubt but that the holding of this conference marks a long step forward toward that objective.

KIRTLEY F. MATHER

The Central States Section of the Botanical Society of America, which is holding its summer meeting jointly with the Northeastern Section in Ann Arbor, Michigan, has scheduled an important business meeting in Rackham Amphitheatre, University of Michigan, at 2:00 p.m., August 20th. This is the first meeting of the newly organized Central States Section and all members are urged to attend.

The American Institute of Electrical Engineers will hold its Pacific General Meeting in San Francisco August 23–26, with headquarters at the Fairmont Hotel. The meeting will be opened at 10:00 a.m., August 23 by George C. Tenney, chairman, followed by a general session with W. C. Mullendore as speaker. Reprints of technical papers may be obtained by writing to the AIEE Order Department, 33 West 39th Street, New York City 18. The uniform price per paper is 30 cents to members and 60 cents to nonmembers. Advance registration may be made through R. O. Brosemer, Chairman, Hotel Committee, 447 Sutter Street, San Francisco 8, California.

The American Chemical Society will hold its 116th national meeting in Atlantic City, New Jersey, September 18–23. Ten thousand chemists and chemical engineers are expected to take part. Titanium, the flame-proofing of textiles, the development of new and safer insecticides, and recent discoveries concerning the nutritional value of vitamin B-12 are among the subjects to be discussed. E. J. Cohn, of Harvard University, will preside at a biological division meeting on protein interactions. J. G. Reinhold, of the Philadelphia General Hospital, will be chairman of a symposium on clinical biochemistry. The Cellulose Division will cooperate with the National Research Council in a symposium on the degradation of cellulose, dealing with research which has produced a bandage for internal use which can be absorbed by the body.

Security clearance of scientists for secret work on atomic energy will receive special consideration. A symposium on security clearance will be held under the auspices of the society's Division of Industrial and Engineering Chemistry, with Wayne W. Hilty, head of the Committee on Professional Relations and Status, as chairman. Spokesmen for the Atomic Energy Commission, the National Military Establishment, private industry, and individual scientists who have had personal experience with existing security regulations will participate.

A colloquium on the mechanism of carbon combustion will be held in Nancy, France, September 27–30, under the sponsorship of Centre National de la Recherche Scientifique. Lother Meyer, of the University of Chicago's Institute of Metals, has been invited to participate. There will be eight participants from England, one from Belgium, and three from France.

A Southeast Asia and Pacific phytosanitary convention was agreed upon at an international conference held April 26–28 in Singapore, on invitation of the British Commissioner General. Some 13 nations or territories of the region were represented, as well as the Food and Agriculture Organization and the South Pacific Commission.

The agreement, which will now be submitted for ratification by all governments of the region, proposes uniform plant quarantine laws and regulations for controlling traffic in living plants and plant products to prevent introduction and spread of new insect pests and dangerous plant diseases. Increasing air travel and commerce have accentuated the danger of introduction of South American leaf blight of rubber and diseases and pests of other crops into Southeast Asia, as well as the introduction of the swollen shoot virus of cacao and related plants from Africa. The agreement is patterned after a similar one, formulated in 1948 in London, to include all of Africa south of the Sahara.

At the 47th annual meeting of the **American Neurological Association** held in Atlantic City, the following officers were elected for the year 1949–50: president, Henry W. Woltman; first vice president, Johannes M. Nielsen; second vice president, E. Jefferson Browder; secretary-treasurer, H. Houston Merritt; and assistant secretary, Charles Rupp.

The Michigan Academy of Science, Arts and Letters at its 53rd annual convention elected the following officers for the ensuing year: president, Paul S. Welch, University of Michigan; vice president, E. C. Beck, Central Michigan College of Education; secretary, Frederick H. Test, University of Michigan; treasurer, James L. Wilson, University of Michigan; and editor, Frederick K. Sparrow, University of Michigan.

On recommendaton of the society's Committee for Promotion of Research, the research grant from the AAAS was divided among the following persons: A. M. Chickering, Albion College, for a continuation of his studies of Panamanian spiders; Dale J. Hagenah, Detroit, to aid in preparation of a bibliography of Michigan botany; William Hovanitz, Wayne University, to aid the analysis of populations in Colias butter-

flies; Volney H. Jones, University of Michigan, for help in field investigations among the Huasteca Indians of Mexico.

The 68th Congress of the Association Francaise pour l'Advancement des Sciences was held at Clermont-Ferrand, Auvergne, France, July 15–21. The inaugural exercises were held in the Municipal Theatre at 10 a.m. Friday July 15 with the mayor of Clermont welcoming the members and guests. At 2:30 the same day the presidents and secretaries of the 26 sections of the association announced the titles of the papers which had been submitted for inclusion in the programs of the separate groups and the sequence of presentation. The section meetings were arranged to avoid conflicts with general papers presented before the congress as a whole. The unusual geological formation of the local area quite naturally afforded an opportunity for a very strong program in this discipline. In addition, there were a number of excursions and field trips of special interest. The total registration was over 350. Malcolm H. Soule, University of Michigan bacteriologist, who was the delegate of the AAAS, was given a medal at the closing session on Thursday, July 21. The 69th congress of the association will be held in Toulouse in late September, 1950.

Deaths

Aristide Fanti, 81, scientific librarian of the National Bureau of Standards from 1910 to 1938, died April 5 in Cheverly, Maryland, after a brief illness. Dr. Fanti contributed largely to the development of an international auxiliary language known as Interlingua.

O. F. Cook, 81, retired botanist of the U. S. Department of Agriculture, died April 23 at his home at Lanham, Maryland. Dr. Cook developed the single-stalk method of cotton culture which is used universally in the U. S. cotton belt.

Otis Freeman Curtis, 61, professor of botany at Cornell University and a member of the Cornell faculty since 1915, died July 4 while vacationing at Chatham, Massachusetts. Dr. Curtis was at one time president of the American Society of Plant Physiologists and was author of several plant physiology textbooks.

William Gerry Morgan, 81, professor of diseases of the digestive tract at Georgetown University since 1904 and its school of medicine from 1931 to 1935, died July 7 of a heart attack in Washington, D. C. Dr. Morgan was a former president of the American Medical Association and a master of the American College of Physicians.

Edward B. Stephenson, 67, superintendent of the Mechanics Division of the Naval Research Laboratory, died of a heart attack May 6 in San Francisco. Dr. Stephenson received a Navy award in 1931 for developing the use of American quartz crystals in underwater sound-detecting devices.

Cosmic ray activity at 20-mile altitudes will be studied next month by an expedition sponsored by the National Geographic Society, Washington, D. C., and the Bartol Research Foundation of the Franklin Institute, Swarthmore, Pennsylvania. The study will be made at the Canadian outpost settlement of Churchill on the shore of Hudson Bay. The program is a continuation of cosmic ray research instituted by the two sponsors and supported by the Air Force and Office of Naval Research. Canada's National Defense Board is cooperating in the undertaking. Martin A. Pomerantz, of the Bartol Foundation, will head the expedition, which leaves August 1. He hopes to develop evidence as to whether the sun is surrounded by a constant magnetic field similar to that of the earth.

Processing of quartz crystals to eliminate deterioration by age has been developed by the Army Signal Corps and is expected to benefit all types of communication, especially radio broadcasting, television, radar, Loran, and guided missile control. Blank crystals are placed on a conveyor belt and drawn through an electrically heated oven for two or three hours, reaching a temperature of 900° F, and then subjected to controlled cooling for 24 hours. The new process is credited to Arthur C. Pritchard, Maurice A. A. Druesne, and David G. McCaa, of the Frequency Control Branch of the Signal Corps Engineering Laboratories at Fort Monmouth, New Jersey.

The Philadelphia General Hospital announces the establishment of a nutrition clinic which, with its research laboratory, will study various nutritional problems among the patients in the hospital and Philadelphia school children. The laboratory is supported by grants-in-aid from Swift and Company and the National Live Stock and Meat Board for studies on the relation of diet to immunity, with particular reference to the effect of meat supplementation to antibody formation. Michael G. Wohl, associate professor of medicine, Temple University School of Medicine, will be chief of this clinic and Katherine Langwell, professor of nutrition at Drexel Institute, will act as nutritionist.

Unified Screw Thread Standards, Circular 479, recently published by the National Bureau of Standards, is now available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C., at 30 cents a copy. The booklet contains the proceedings of the meeting which resulted in the unification of American, British, and Canadian standard systems of screw threads, (see *Science,* April 1, 1949, p. 346), and includes detailed illustrations, tables, and numerical data. Remittances from foreign countries must be in U. S. exchange and must include one-third the publication price to cover mailing costs.

Make Plans for—

American Mathematical Society, August 30–September 2, 55th summer meeting in conjunction with summer meetings of **Econometric Society, Institute of Mathematical Statistics,** and **Mathematical Association of America,** University of Colorado, Boulder.

American Institute of Chemical Engineers, regional meeting, September 6–8, Montreal, Canada.